11-23-2012 12:00 AM

Gender Neutral? An Empirical Test of Life-course Theories of Criminal Behaviour

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A thesis submitted in partial fulfillment of the requirements for the degree in Doctor of Philosophy

GENDER NEUTRAL? AN EMPIRICAL TEST OF LIFE-COURSE THEORIES OF CRIMINAL BEHAVIOUR

(Spine Title: Gender Neutral? An Empirical Test of Life-course Theories of Criminal Behaviour)
(Thesis format: Monograph)

by

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Graduate Program in Sociology

A thesis submitted in partial fulfilment
of the requirements for the degree of
Doctor of Philosophy

School of Graduate and Postdoctoral Studies
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entitled:

Gender Neutral? An Empirical Test of Life-Course Theories of Criminal Behaviour

is accepted in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

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ABSTRACT

The current study systematically assesses four mainstream theories – General Theory of Crime, Interactional Theory, Dual Taxonomy, and Age-graded Theory of Informal Social control – of criminal behaviour over the life-course; while examining the role of gender and several measures argued to be important in explaining the criminal behaviour of women. This study also explores both the within- and between-person variance (i.e., the role of population heterogeneity) and lag effects (i.e., the role of state dependence) in explaining the criminal behaviour. Random-Effects Negative Binomial Models are used to predict both serious and non-serious criminal behaviour over the life-course using panel data collected in the National Youth Survey. This study shows: 1) further integration of theories is required to better explain criminal behaviour; at minimum, current life-course theories need to consider additional factors in explaining criminal behaviour; 2) gender-specific theorizing and modelling about criminal behaviour are not necessary when theories are integrative; 3) random-effects modelling is useful in considering both between and within-individual effects while providing the opportunity to assess both population heterogeneity and state dependence; 4) lag effects are important in explaining the criminal behaviour of men and women. The findings in this study enhance our understanding of the role of gender, population heterogeneity, and state dependence in criminal behaviour and can play a role in the development of future theory development, research methods, and policy. These findings provide impetus for further integration of criminological theories and the explicit inclusion of the concepts of population heterogeneity and state dependence.

Keywords: gender, criminal behaviour, life-course, population heterogeneity, state dependence

ACKNOWLEDGEMENTS

I would like to thank my advisors for their guidance; without it, this project would not have been realized. I would also like to thank my examination committee for their time and consideration of my work. Additionally, I would like to thank all my friends and family for the support over the years, especially my husband Kevin Harris. All of their words of support and encouragement were greatly appreciated. Finally, I would like to thank the management of and my colleagues at the Research Branch of the Correctional Service of Canada who supported the completion of this degree in many ways. Again, thank you to everyone for the support.

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CHAPTER 1: HISTORY, THEORY, EMPIRICAL STUDIES AND THE LIMITATIONS OF RESEARCH ON CRIMINAL BEHAVIOUR OVER THE LIFE-COURSE

This study examines the role of gender in theories of criminal behaviour over the life-course. Specifically, are theories gender-neutral or are gender-specific theories needed to explain the criminal behavior of men and women? This section provides an overview of the history of research on criminal behaviour over the life-course while considering the role of gender. Particular attention is paid to gender similarities and differences in criminal behaviour. Four theories of the development of criminal behaviour over the life-course are discussed: the General Theory of Crime, the Interactional Theory, the Dual Taxonomy of Offending, and the Age-graded Theory of Informal Social Control. For each, there is a specific focus on their theoretical concepts, consideration of the role of gender, their operationalization of key variables and hypotheses. The empirical literature that tests these theories is examined to determine whether there is evidence of gender invariance in each theory's ability to explain criminal behaviour.

History of Research on Criminal Behaviour Over the Life-course

Since the 1930s, criminologists have been interested in how criminal behaviour occurs over the life span. This research has continued through the development of longitudinal studies to aid in the empirical examination of criminal behaviour over the life-course. One of the main goals of this research is to examine the onset, stability and change in criminal behaviour over time. Many of the initial studies in this field simply examined age of onset, frequency, severity, and desistance from criminal behaviour and the link between juvenile delinquency and adult criminal behaviour. From the 1960s to date, longitudinal studies examined many social factors believed to lead to criminal outcomes in both childhood and adulthood. Research on the unfolding of criminal behaviour over the life-course led to the development of theories on the etiology of criminal behaviour. Much of the research, over the past two decades, has been dedicated to empirically testing these theories. An examination of the longitudinal research conducted from the 1930s to the present will aid in the understanding of how life-course research of criminal behaviour has developed during the 20th and 21st Centuries.

1930s Major Longitudinal Studies of Criminal Behaviour Over the Life-course. Studies dedicated to understanding the development of criminal behaviour over the life-course began in the 1930s. The Gluecks examined the impact of childhood delinquency and its social correlates on adult criminality[1]. Another project, the Cambridge-Somerville Youth Study, started in 1935, examined the effects of different types of prevention programs on criminal outcomes.[2] Together, these two studies are the longest running "matched pairs" longitudinal projects examining criminal activity over the life-course of males. Both of these studies matched delinquent boys with non-delinquent boys in a counterfactual design, in order to isolate demographic, psychological and social differences between the two groups in their criminal behaviour over time. In both studies, researchers matched the boys on age, physical health, IQ, personality, delinquency prognoses, household factors, and neighbourhood characteristics (Power and Witmer 1951:6-8; Glueck and Glueck 1950:34). This research uncovered several social correlates of delinquency and later criminal activity such as low IQs, antisocial personalities, delinquent peers and inadequate parenting skills. The delinquents tended to be from poor neighbourhoods and homes that did not meet the psychological needs of children (McCord 1992:203-204; Power and Witmer 1951:252-256; Glueck and Glueck 1950:34).

Overall, the major finding of these early studies is that delinquency in childhood was the strongest predictor of criminality in adulthood and that continuity, rather than discontinuity, characterized crime over the life-course. These studies began the modern day examination of criminal activity over the life-course. This research specifically highlights the continuity in criminal behaviour. Furthermore, these studies throw light on the social correlates of delinquency that may be used to increase desistance over the life-course, such as better parenting skills, two-parent households, flexible school programming, adequate housing, recreational facilities, early treatment of maladaptive behaviour and marriage. These studies, however, were limited by research design and choice of sample. Participants were not randomly selected decreasing both the internal

[1] In their study, 500 delinquent boys from the Massachusetts correctional system, aged 10 to 17, were matched with 500 non-delinquent boys from the Boston School System (Glueck and Glueck 1950). The initial data collection began in 1939 and continued until 1948. Second and third waves of data were collected when the subjects were aged 25 and 32, respectively (Glueck and Glueck 1968).

[2] This study followed 253 matched pairs of boys from age 10 or younger until 1945 (McCord 2003). The second and third waves of data were collected in 1948, and between 1975 and 1981.

and external validity of the findings. The matched-pair design attempts to control for many confounding factors in research, but these studies maintained relatively few subjects. They are also limited to boys. The ability to generalize findings to the population at large is restricted.

1940s Major Longitudinal Studies of Criminal Behaviour Over the Life-course. Several studies, commenced in the 1940s, used cohort analyses to examine criminal behaviour. They used large birth cohorts from specific cities rather than non-randomly matched-pairs. Two cohort studies in different American cities emerged around the same time.[3] Two other cohort studies began in Great Britain in 1946 and 1947.[4] Each of these studies followed a cohort of children to examine the unfolding of criminal behaviour. These cohort analyses collected demographic and psychosocial information such as age, gender, social class, neighbourhood characteristics, employment, school outcomes, residential mobility, parenting skills and delinquent peers.

Several major findings regarding criminal behaviour over the life-course and its correlates emerged from these analyses. These studies drew attention to the age-crime curve. This curve demonstrates that offending begins between the ages of 12 and 13 years for boys and slightly later for girls. It peaks at approximately age 16 for males and age 18 for females, with a steady decline in criminal behaviour from these ages to almost nil after the early twenties and the most serious offences are committed after the peak age of

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[3] The first is a study of three birth cohorts in Racine, Wisconsin. Shannon (1998; 1991; 1988) examined the offence data for three birth cohorts born in 1942, 1949, and 1955 (both males and females were included). Researchers collected data retrospectively from ages 6 to 33, 6 to 27, and 6 to 33 for the 1942, 1949, and 1955 cohorts, respectively (Shannon 1998). The second cohort study emerging in the 1940s was Wolfgang, Figlio and Sellin's (1972), *Delinquency in a Birth Cohort*. This study examined the offending patterns of almost 10,000 boys who were born in 1945 and living in Philadelphia, Pennsylvania from the ages of 10 to 18. The study followed another 10% of the sample until age 30 (Wolfgang, Thornberry, and Figlio 1987). Another study was completed to replicate the original *Delinquency in a Birth Cohort* study. This study included both males and females, born in Philadelphia in 1958. The authors examined these subjects until the age of 30 (Tracy et al. 1990).

[4] The first was the National Survey of Health and Development, started in England, Scotland and Wales in 1946. In this study, all 5,326 legitimate children born in a single week in March 1946 were followed until 1999 (Medical Research Council 2007). After their birth, data were collected from the children at ages two, four, six, seven, eight, nine, 10, 11, 13, 15, 16, 19, 20, 22, 24, 25, 26, 31, 36, 43, and 53. The second study, a smaller scale survey, followed 1,142 children born between May 1 and June 30, 1947 in the town of Newcastle upon Tyne (Miller et al. 1974). This cohort was followed-up five times per year until the age of seven. After this age, the data were collected on an annual basis until the subjects reached the age of 15. The final full follow-up was completed when the cohort was 22 years old, and criminal records were collected for this cohort up to age 33 (Kolvin et al. 1988; Miller et al. 1974).

offending for all crimes. Additionally, it indicates that the average number of offences occurs at later ages (Shannon 1998:33; 1988:32-36; Tracy, Wolfgang, and Figilo 1990:207; Kolvin et al. 1988:92; Wolfgang, Thornberry, and Figlio 1987:197). Earlier onset increases the mean number of offences over the life-course, though not severity, with age being positively correlated with severity of offending (Wolfgang et al. 1987:197). Again, criminal behaviour from childhood to adulthood was found to be remarkably stable.

Another major finding of these studies is that a very small number of offenders were responsible for the majority of offences (Shannon 1998:181; 1991:194; 1988:217; Tracy et al. 1990:66; Wolfgang et al. 1987:84). Social correlates, such as unemployment, lower attainment in school, dropping out of school, delinquent peers, lower social class, poor parenting, and increased residential mobility positively correlated with criminal behaviour (Shannon 1998; 1991; 1988; Tracy et al. 1990; Wolfgang et al. 1987; Miller et al. 1974:203-210).

These studies were the first to note the difference in the criminal behaviour of men and women. Men were more likely than women to behave criminally at all stages of the life-course (or at least to the age of 30); and women had different sets of psychosocial correlates of crime than men (Shannon 1991; Tracy et al. 1990; Kolvin et al. 1988).

These cohort studies involve early attempts to predict criminal behaviour; however, there is little ability to predict criminal outcomes (Shannon 1998:71-84). Miller et al. (1974:210-211) note the difficulties in predicting criminal outcomes because of the multiple determinants of criminal behaviour, and hold that many other factors must be examined more closely to improve prediction of delinquency. The limited number of social correlates measured in these studies led to the next wave of research.

1950s Major Longitudinal Studies of Criminal Behaviour Over the Life-course. The 1950s marked a period of prospective longitudinal research on criminal behaviour over the life-course, with several studies employing this type of design.[5] These studies

[5] Hathaway and Monachesi's longitudinal (1963) study focussed on linking personality type to criminal behaviour using the Minnesota Multiphasic Personality Inventory (MMPI). This study examined 11,329 Grade 9 students in Minneapolis, Minnesota in 1954, 1956 and several more times over a total of 15 years. Werner and Smith (2001) conducted another prospective study, examining negative adult outcomes of 700 youth from Kauai, Hawaii, followed from birth in 1955 until mid-adulthood in 1995-96. The outcomes addressed by the study relate to a wide variety of topics, such as learning disorders and educational

have notably smaller samples than their cohort counterparts of the 1940s, and focus on the relationship between the various facets of child development and criminal behaviour over the life-course. Items measuring many social factors that were absent from previous studies were introduced during this wave of research.

This generation of studies followed children prospectively from birth to mid-adulthood. Similar to previous longitudinal research, these studies examined many correlates of crime, such as age, gender, social class, school outcomes, parenting skills and delinquent peers (see Hogh and Wolf 1983; Janson 1983). Furthermore, these studies were able to collect information that had not previously been associated with criminal behaviour, such as prenatal and birth complications, family stability, life events, large family size, single motherhood and high number of marital changes (see Gomez-Smith and Piquero 2005; Baker and Mednick 1984; Werner and Smith 1982). Unlike much of the previous research, the National Collaborative Perinatal Project-Philadelphia subsample focuses on a sample of African-American youth with the lowest

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achievement, physical and mental health problems, antisocial and criminal behaviour. Werner, Biermann, and French (1971) examined these 700 youth from the prenatal period up to age 10. Three other follow-ups were also conducted. The first follow-up was at age 18 and the other two follow-ups were in adulthood (ages 31-32 and around age 40) (Werner and Smith 2001; 1992; 1982).

The year 1959 marked the initiation of another longitudinal study, the National Collaborative Perinatal Project. In the prospective portion of this study, 42,000 pregnant women and their 55,000 offspring, from 12 cities across the U.S.A., were followed from birth through to around age seven and the retrospective portion included a subsample of 987 participants born to African American women in Philadelphia between 1952 and 1962 (Gomez-Smith and Piquero 2005). A team from the University of Pennsylvania collected retrospective data on these subjects at two times. The first wave of data collection took place in the 1980s, and collected information about the participants up to the age of 17. In 1998, the second wave of data collection was completed and participants ranged in age from 36 to 39.

Three major studies were conducted in Europe in the 1950s. The first, a cohort study, Project Metropolitan, began in 1953 in Stockholm, Sweden. This study followed all children born in the Stockholm area in 1953 that still resided there in 1963 (15,117 children) (Janson 1983). The project followed the children into middle adulthood. For this study, detailed demographic and medical information was recorded at the time of their birth, educational testing was completed in 1966, maternal interviews were conducted in 1968, and police records were collected up to 1983. The second major study began in Copenhagen and area in 1953. Similar to the Stockholm study, detailed information was collected at birth for 12,270 boys (Hogh and Wolf 1983). The authors conducted two follow-ups with all children in 1965 and 1966 (Hogh and Wolf 1981). A third follow-up in 1968 collected data on family characteristics from a sample of 25% of the male cohort. A final set of data were collected for the full original cohort, obtained from national registries of demographic and crime data up to 1976. The third study, the Danish Prospective Longitudinal Perinatal Study, started in 1959. This study followed all children born at Righospitalet Hospital in Copenhagen, Denmark between September 1959 and December 1961 (Baker and Mednick 1984). Of the 9,125 children born during this period, only 265 participants were included in the study of criminal behaviour over the life-course (Kandel and Mednick 1991); however, participant information can be linked to the Danish National Criminal Registry to follow the criminal behaviour of all members of the cohort study after the age of 17 (Raine, Brennan and Mednick 1994).

socioeconomic statuses who would be at high risk of serious and violent offending (Gomez-Smith and Piquero 2005:519). This study examines the association of many social and psychological factors with the most serious forms of offending, and aids in understanding of the correlates of serious criminal behaviour over the life-course. Project Metropolitan, in both Stockholm and Copenhagen, attempted to link criminal behaviour in adulthood (especially violent behaviour) to experiences in childhood (Hogh and Wolf 1983; Janson 1983). Detailed birth records collected by the Danish Prospective Longitudinal Perinatal Study allows the examination of the effect of perinatal and birth complications on criminal behaviour over the life-course.

Overall, the research from the 1950s furthered the understanding of criminal behaviour over the life-course. More specifically, a study by Werner and Smith (1982) confirms the differential correlates of criminal behaviour for males and females. Werner and Smith (1982:153-154) find that for females both low IQ and the need for mental health services by the age of 10 are predictive of delinquency later in life. For males, social class, a low level of maternal education, low family stability (i.e., broken homes) and school problems are predictive of later delinquency. Some of the studies (Raine, Brennan and Mednick 1994; Kandel and Mednick 1991) from this decade suggest that differences in trajectories of criminal behaviour may start as early as birth.

Although these studies surpassed previous work, they generally only measure these correlates at three points in time over approximately 40 years. The lack of precision in the measurement of the timing of social events and criminal behaviour affects the ability to ascertain causality. As it turns out, these shortcomings would be addressed with multiple follow-up periods involving more precise measurement of socio-psychological factors and criminal behaviour in the next wave of research on this topic.

1960s and 1970s Major Longitudinal Studies of Criminal Behaviour Over the Life-course.

The studies of the 1960s and the 1970s focus on detailed measurement of psychosocial correlates and criminal behaviour, including the timing of relevant factors. Many of these studies followed their participants into middle adulthood (until about age 30).[6] The

[6] Lefkowitz, Eron, Walder, and Huesmann (1977) conducted a prospective longitudinal study. This study followed 856 children between the ages of eight and 19 based on two waves of data collection from

prospective studies from the 1960s examine the development of criminal behaviour from later childhood into mid-adulthood.

These studies highlight various aspects of the development of criminal behaviour. For example, some studies (see Huesmann et al. 2002; Sommers and Baskin 1994; Magunsson 1988) empirically validate the positive link between juvenile delinquency and criminal behaviour in adulthood. Farrington, Lambert and West (1998:101) find that age of onset is positively and directly related to both length of criminal career and severity. Many of the "original" findings regarding the development of criminal behaviour over time have been replicated by this research, such as the shape of the age-crime curve, typical age of onset, peak age of desistance, the disproportionately large amount of crime committed by relatively few offenders, and the stability in criminal behaviour from youth to adulthood (see Farrington 1983). The Individual Development and Adaptation Study also provides evidence that social maladjustment as early as age 13 is associated with arrest and convictions later in life (Magnusson 1988). This generation of studies provides additional evidence of a strong positive link between experiencing birth complications, maternal rejection, and non-traditional family structure and later criminal behaviour (e.g., Raine, Brennan and Mednick 1997 and 1994). Furthermore, these studies show a strong link between antisocial and psychopathological personality traits and offending during

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Columbia County, New York between 1960 and 1970. Another follow-up was completed at age 30 (Huesmann, Eron, and Dubow 2002). The Cambridge Study in Delinquent Development, an additional study started in 1962, followed 411 working-class boys in London, England from ages eight and nine (Farrington 2000). This prospective research design included interviews and testing at the ages of eight, 10, and 14. Additional interviews were conducted at ages 16, 18, 21, 25, 31,and 46, and conviction records were also collected up to age 40. Another study conducted in the 1960s was the Marion County Youth Study in Oregon, commenced in 1964 and completed 15 years later (when participants were 30 years old) (Wright, Carter and Cullen 2005). The longitudinal portion of the study followed 809 male youth randomly selected from the initial interview in 1964, of whom 303 had official records as juveniles, 127 had dropped out of school, and 379 had police contact at anytime during the 15 years of the study. Participants were interviewed in 1964, 1967, and almost annually thereafter until 1979. In total, researchers collected data from 12 follow-up interviews or surveys.

Several studies also began in Europe during the 1960s. The Individual Development and Adaptation Study initiated in 1965 in Oreboro, Sweden, followed 1,025 grade three children (Magunsson, Duner, and Zetterbolm 1975). After the initial data collection in 1965, when the subjects were approximately 10 years old, the group was followed until 26 years of age (Magunsson 1988). Another relevant study started in 1966 in Northern Finland involving the examination of 12,058 children from birth in 1966 until age 32 (Sauvola et al. 2002). This study initially assessed families at the birth of the cohort member and again when the cohort member was 14 years of age. Data on criminal behaviour was collected retrospectively from the Ministry of Justice. Another study from Finland (specifically, Jyvaskyla) began in 1968. This study followed 196 boys and 173 girls from the ages of eight/nine with data collected at ages eight, 14, 20, 26, and 36 (Pulkkinen et al. 2000; Pulkkinen and Pitkanen 1993).

childhood and adulthood (e.g., Pulkkinen et al. 2000; Virkkunen et al. 1994; af Klinteberg et al. 1993; af Klinteberg, Humble and Schalling 1992).

All of these studies increase our understanding of the complexity of the development of criminal behaviour. The major addition in research by this generation of studies is the use of multiple follow-ups. These studies provide much-needed replication of many of the findings from previous longitudinal research on criminal behaviour.

This line of research continued in the 1970s. Significant features of the studies initiated during this decade include research beginning in the early stages of the life-course, the inclusion of many psychosocial variables, and the specific goal of examining stability and change in criminal behaviour over the life-course as well as prediction of criminal behaviour. Seven major studies started in the 1970s[7]. Each of these studies

[7] The Montreal study began in 1974 and involves a longitudinal examination of 1,684 adolescents and 470 convicted youth (LeBlanc and Frechette 1989). Researchers contacted the children initially between the ages of 12 to 14. A follow-up was conducted two years later, and a third wave of data was collected six years after the first follow-up. The final data collection was only with the delinquent participants (who were on average 23 years old). The Monitoring the Future study (started in 1975 and continuing today) studies youths in grade eight, 10, and 12 annually with a cross-sectional research design (Monitoring the Future 2007). The project became longitudinal when a random selection of students in the senior classes of 1976 was chosen and since then has been followed-up bi-annually. This study involves 15 waves of data, with 31 years of information on the participants selected from the 1976 senior classes.

Both the Dunedin Multidisciplinary Health and Development Study and the National Youth Survey began in 1976 and are ongoing. The Dunedin Multidisciplinary Health and Development Study is following 1,037 people who were born from April 1, 1972 to March 31, 1973 in Dunedin, New Zealand and who were still living in the area three years later (Moffitt et al. 2001a). This study has had 10 follow-ups since the initial screening at the age of three (Moffitt et al. 2001). The follow-ups were completed when study participants were five, seven, nine, 11, 13, 15, 18, 21, 26, and 32 years old (The Dunedin Multidisciplinary Health and Development Study 2005). The National Youth Study is a nation-wide project involving a random sample of 1,725 children in the United States (Elliott and Menard 1996). At the time of initial contact, the youths were 11 to 17 years old, and were 39 to 45 years old in the last follow-up to date (National Youth Survey Family Study 2007). In total, nine waves of data have been collected since the initial collection in 1976. The collection of waves two to five took place between 1977 and 1980. The authors used a retrospective design for the next four waves of data. The sixth wave of data collection occurred in 1983, at which time information was collected for 1983, 1982, and 1981. Similarly, the seventh wave, in 1986, involved the collection of information for 1986, 1985, and 1984. The eighth wave of data was collected in 1989, and the ninth wave was collected in 1992 (Menard 2000). Since that time, another two waves have been collected: the 10th wave in the mid-1990s and the 11th wave in 2004.

Another study started in Christchurch, New Zealand in 1977. The Christchurch Health and Development Study followed 1,265 children from birth. Follow-ups took place at 4 months, annually from ages one to 16, and periodically at age 18, 21, and 25 (Fergusson et al. 2007). The Criminal Career and the Life Course study began in 1977 in the Netherlands, and followed 5,164 subjects representing four percent of all criminal cases tried in the country that year (Blokland and Nieuwbeerta 2005). Using data compiled from the Criminal Record Office, criminal career histories were retrospectively reconstructed. The authors combined this information with demographic information collected by the Population Registry including data on birth, marriage, fertility, and death. Another longitudinal study examining criminal careers began in 1979 in Denmark. This study included a random sample of 333,742 people representing 1/15 of the people

followed children (from birth or youth) into adulthood. Researchers designed these studies to measure precisely the known correlates of criminal behaviour and to assess the predictive ability of childhood and adolescent factors on serious adult offending. Each of these studies includes very detailed measures of family, school and work environments, as well as many measures of physiological, psychological and social development relating to family, peer, and partner relationships. These studies were designed to isolate the timing of both psychosocial and demographic correlates. The precise measurement of the timing of these social events allows for a detailed examination of change and stability in criminal behaviour over the early life-course, as well as an assessment of how change and stability relate to several social and psychological factors. Furthermore, the design of the studies of criminal careers allow for a more detailed examination of the heterogeneity of onset, persistence, severity, and desistance in criminal behaviour among offenders.

The major finding of these studies pertains to the stability and complexity of the link between childhood and adult criminal behaviour. These studies provide evidence that offenders may not be a homogenous group with a similar etiologic cause of criminal behaviour. Rather, offenders appear to be a heterogeneous group of people and as such may experience different etiologic causes of offending (Moffitt 1993:674). Explaining these findings required the development of more complex theories of criminal behaviour than previous descriptive work. More studies of criminal behaviour with even more precise measurement of social events and their timing over longer portions of the life-course were also necessary. With strong data necessary for theoretical understanding of criminal behaviour, a new phase of the research process began in the 1980s. Alongside the development of more intense designs of research with highly precise measurement, many researchers aimed to develop theoretical explanations of criminal behaviour over the life-course in the subsequent decades.

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in the Central Person Registry (Kyvsgaard 2003). The subjects ranged from 15 years to 100 years of age and were followed from 1979 to 1991.

1980s and 1990s Major Longitudinal Studies of Criminal Behaviour Over the Life-course.

Several studies began in the 1980s[8] and 1990s[9]; however, due to the relatively recent starting date of these studies (the oldest participants are now just over 30 years old and the majority are in their mid-20s) they are currently unable to examine the unfolding of criminal behaviour past early adulthood.

These studies provide some of the best longitudinal research to date, partly because of the design and measurement of many variables and the timing of these variables. Many of these works assess the ability of various indicators to predict criminal

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[8] The Mater-University of Queensland Study of Pregnancy (2003) started in 1981 in Queensland, Australia with data collected on 8,556 pregnant women. Children of these women were followed in the years after birth, with interviews (with mothers initially and children as they aged) and data collection occurring at six months, and ages five, 14, and 21. The Oregon Youth Study began in 1983. A total of 206 boys in the fourth grade (approximately aged nine or 10) from the Eugene and Springfield area were randomly selected to participate in this study (Oregon Social Learning Center 2007). Assessments of participants have taken place yearly since the age of nine or ten, with participants now into their 30s. The longitudinal portion of the Seattle Social Development Project began in 1985 in Seattle, Washington. In this study, 808 grade five students have been followed since the age of 10, with additional follow-ups conducted yearly until age 16 and then again at ages 18, 21, 27, and 30 (Seattle Social Development Project 2007; Chung et al. 2002). The Pittsburgh Youth study has followed 1,517 males who were aged seven to 13 years old in 1987 (Kelley et al. 1997). From 1987 to 1992, participants were interviewed twice a year at six month intervals (Moore 2006). Since 1992, follow-up on these participants has occurred annually. The Denver Youth Study was a random sample of 1,500 youth from high-risk neighbourhoods in Denver, Colorado in 1987. Generally, participants completed a yearly interview from 1988 to 1999. The Rochester Youth Development Study is part of the same project that includes the Pittsburgh Youth Study and the Denver Youth Study, but it started a year later. Of these 1,000 participants the majority were male and from high-risk communities. Similar to the Pittsburgh Youth Study and the Denver Youth Study, semi-annual follow-ups were conducted with the grade seven and eight students from 1988 to 1992; from 1994 to 1996, annual follow-ups were conducted. The National Educational Longitudinal Study, also initiated in 1988, involves a national random sample rather than a city sample. Approximately 25,000 grade eight students first completed surveys in 1988, with follow-ups in 1990, 1992, 1994, and 2000 (Institute of Educational Science U.S. Department of Education 2007). The Youth Development Study has followed 1,000 freshman students who attended public school in St. Paul, Minnesota since 1988 (Mortimer and Staff 2004). Participants followed-up annually from 1988 to 1995, and once in 2000. The last wave of data collection took place in 2002, at which time the participants were between the ages of 29 and 30 (Massoglia and Uggen 2002).

[9] The National Longitudinal Survey of Children and Youth, initiated in 1994, is a nationally representative sample of Canadian children in all 10 provinces (Statistics Canada 2006). Children in the first cohort were between birth and 11 years old in the first wave of the study. The second, third, fourth, fifth and sixth waves of data were collected in 1996, 1998, 2000, 2002, and 2004, respectively. A second cohort was added in 2000 and is also being followed from birth to 11 years old; and a third cohort was added in 2002. Also started in 1994, the National Longitudinal Study of Adolescent Health in the United States followed a nationally representative sample of children in grades seven to grade 12 (ages 12 to 18) (Carolina Population Centre 2005). The first, second, and third waves were conducted in 1994, 1996, and 2001/02. Another nationally representative longitudinal study in the United States, the National Longitudinal Survey of Youth, was initiated in 1997. This study involves 8,984 youths, who were aged 12 to 16 at the time of initial contact in 1997. Data collection took place annually from 1998 to 2007, resulting in seven other waves of data (US Department of Labour 2007).

behaviour over the life-course. These studies provide an opportunity to validate empirically theories of the development of criminal behaviour over the life-course as the participants are now entering middle adulthood, allowing a detailed examination of the unfolding of criminal behaviour.

Research on Criminal Behaviour over the Life-course: 1950- 2000.

These studies, conducted over the past six decades, aid in developing an understanding of criminal behaviour over the life-course. The longitudinal designs of these studies have allowed for the examination of within-individual as well as between-individual variation research as well. These studies display consistent findings about criminal behaviour in five areas: 1) the age-crime curve, 2) chronic offenders account for the majority of crime, 3) predictors of criminal behaviour, 4) continuity in offending over the life-course, and 5) offenders and their offences are heterogeneous.

Previous studies illustrate several findings related to the age-crime curve. More specifically, these studies demonstrate consistent findings regarding the age of onset, peak age of offending and desistance from criminal behaviour. In several studies, age of onset has been negatively associated with length of criminal behaviour. These studies suggest that the younger individuals who engage in criminal behaviour have longer histories of criminal behaviour (see Tracy et al. 1990:217; Kolvin et al. 1988:88 ; Shannon 1988:218; Wolfgang et al. 1987:197; Farrington 1983:33). This group of studies also indicates that depending on the type of offence the peak age of offending occurs at different points in the life-course. Less serious crimes such as shoplifting peak between the ages of 16 and 18, whereas the peak age for more serious crimes occurs later in life (for example, see Shannon 1998:38-39; 1988:32; Wolfgang et al. 1987:197). These peak ages have been consistent over the past four decades.

Several studies suggest that desistance occurs around 21 years of age, although this is dependent on type of offence and the definition of desistance (see Sampson and Laub 2003:19; Shannon 1998:32; 1988:32-39; Kolvin et al. 1988:87; Wolfgang et al. 1987:196). Several factors predict desistance, such as marriage or having job satisfaction, residential upper mobility, and joining the military (Sampson and Laub 2003:148-149).

Some have observed that a small number of offenders account for the majority of crimes committed. For example, Wolfgang et al. (1987:84) estimate that 6% of offenders

account for over 50% of crime. Shannon (1998:185; 1988:217) and Tracy et al. (1990:217) provide similar estimates. This suggests that the majority of the population do not engage in criminal behaviour, and when they do behave criminally, it is not frequently.

Several studies examine the individual, environmental, and other social factors that predict criminal behaviour. Individual risk factors, including low intelligence, low achievement in school, hyperactivity and impulsivity, affinity for risk-taking, and having an anti-social personality have all consistently been found to be strong predictors of criminal behaviour (for example, see Kolvin et al. 1988; Werner and Smith 1982; Miller et al. 1974; Glueck and Glueck 1968; Power and Witmer 1951). Family-related predictors are consistently linked with criminal behaviour: poor parental supervision, harsh and/or inconsistent discipline, low attachment to parents, childhood neglect, broken homes, and criminal family members (see Gomez-Smith and Piquero 2005; Baker and Mednick 1984; Hogh and Wolf 1983; Janson 1983; Werner and Smith 1982). Many studies also suggest that lower social class, the presence of delinquent peers, peer rejection or low popularity, high rate of truancy, and high rates of neighbourhood crimes are linked with increased criminal behaviour (see Gomez-Smith and Piquero 2005; Werner and Smith 1982).

Continuity in offending over the life-course is the most frequently researched topic in this field of study. In fact, the first study conducted to examine criminal behaviour over time was designed to assess this continuity (see Glueck and Glueck 1950). The majority of studies indicate a strong link between offending as a juvenile and the continuation in adulthood (e.g., see Sommers and Baskin 1994:483; Huesmann et al. 2002:200; Magnusson 1988; Farrington 1983:33); however, more recent observations suggest that this continuity is far more complex than indicated by previous research.

Research by Moffitt and Caspi (2001:368-369) shows that there is heterogeneity in offending over the life-course, not only are offenders heterogeneous in respect to their criminal involvement, but their criminal behaviours are also heterogeneous. Although the concept of criminal career suggests that offenders specialize in particular crimes, evidence suggests that offenders engage in many criminal behaviours rather than specializing in one type (Piquero 2000:408; Capaldi and Patterson 1996:226).

One notable feature of the studies examining criminal behaviour over the life-course is the lack of attention to the behaviour of women with the majority of studies examining only males. Even when gender is considered, little is noted beyond highlighting the following differences: 1) men are more likely than women to persistently commit crimes at all stages of the life-course (e.g., see Fergusson and Horwood 2002:175; Steffensmeier and Allan 1996:460; Canter 1982:387); 2) the criminal behaviour of men in comparison to women is significantly more likely to be violent (e.g., see Francis, Soothill and Ackerley 2004:109-112; DeLisi 2002:32-33; Steffensmeier and Allan 1996:460-461; Triplett and Myers 1995:76); and, 3) although similar in some cases, the psychosocial correlates that predict criminal behaviour of men are relatively less effective in accounting for the criminal behaviour of women.[10]

Given that research on criminal behaviour over the life-course has paid little attention to gender differences, it is not surprising that few gender-specific theories of criminal behaviour over the life-course have been proposed. To date, the theories that examine this behaviour do not consider, or as others argue ignore, the impact of gender.

Theories of the Development of Criminal Behaviour Over the Life-course

The simplest way to classify theories of criminal behaviour is by the nature of criminal behaviour. One can consider criminal behaviour over the life-course as static or dynamic. Static theories argue that rates of criminal behaviour are stable over the life-course due to an underlying propensity for criminal behaviour and that life changes do not affect them; whereas dynamic theories argue that rates of criminal offending can change over the life-course due to changes in social circumstances (Nagin and Farrington 1992:501-502).

Static and Dynamic Theories.

Also known as theories of population heterogeneity, static theories state that once a criminal propensity is set, whether through biological, social, or psychological factors, this criminal propensity is stable. The implication of this stability is that once an individual's criminal propensity is set (typically in early childhood) relatively little will change about their life-long involvement in criminal behaviour.

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[10]For example, see Juon, Doherty and Ensminger (2006:2008); Piquero et al. (2005a:46); Van Lier et al. (2005:851-852); Farrington and Painter (2004:11-12); Junger-Tas, Ribeaud, and Cruyff (2004:367-377); Hartjen and Priyadsini (2003:400); Fleming et al. (2002:436); Laundra, Kiger and Bahr (2002:401); Moffitt and Caspi (2001:365); Piquero and Chung (2001:197); Mears, Ploeger and Warr (1998:263).

The concept of population heterogeneity suggests that the propensity for criminal behaviour varies between individuals, ranging from no criminal propensity to extreme criminal propensity. It follows that individual differences in criminal behaviour relate to the variance of the stable propensity to offend across the population (Nagin and Paternoster 2000:120). Furthermore, because this criminal propensity exists before most of life's events and may even affect these events, static theories consider many of the social predictors of crime to be spurious (Nagin and Paternoster 2000:129).

The other broad type of theory is dynamic, also referred to as theories of state-dependence. These theories propose that changes in criminal behaviour over the life-course are reflective of changes in important social statuses or psychological factors. These factors vary with age and social stage and have a differential impact on criminal behaviour. Nagin and Farrington (1992:502) argue that theories require at least one of two features to be considered dynamic. The first central feature of a dynamic theory is the notion of state-dependence. This concept proposes that prior behaviour or events are causally linked to future events. For example, previous criminal behaviour can negatively affect social relationships that may have restrained criminal behaviour in the past, in turn leading to more criminal behaviour. Conversely, previous prosocial behaviour may lead to a decrease in future criminal behaviour (Nagin and Paternoster 2000:140). In this interpretation, social events and networks can serve as transition points and change the trajectory of criminal offending. The second defining feature of dynamic theories is the general contention that social events affect behavioural trajectories at different social stages or ages over the lifespan (Nagin and Farrington 1992:502). For example, marriage may act as a form of social control that inhibits future criminal behaviour.

In recent years, several theories have been developed that incorporate both static and dynamic features. These integrative theories contend that a propensity for antisocial behaviour in early life leads to chronic criminal behaviour over the life-course, but they simultaneously argue that social events over the life-course can act as points of transition in criminal trajectories. Alternatively, these transition points can divert a prosocial trajectory toward a life path with criminal behaviour. Also, typological theories generally integrate both static and dynamic features. They theorize that there is a small number of subgroups within the offender population that display similar patterns of criminal

behaviours and have sociodemographic and psychosocial correlates that predict these patterns of criminal behaviour (i.e., different etiologies of crime, some static and some dynamic factors, are responsible for differential patterns of criminal behaviour).

Although several theories[11] of the development of criminal behaviour fall into each of these broad theoretical frameworks, only the General Theory of Crime can be considered a purely static theory. Another popular theory, the Interactional Theory, is primarily dynamic. Finally, two of the theories examined here are considered to be integrative theories and include elements of both static and dynamic frameworks: the Dual Taxonomy of Offending and the Age-Graded Theory of Informal Social Control; however, the Dual Taxonomy is generally considered a typological theory.

Static Theories - General Theory of Crime.

Gottfredson and Hirschi (1990:87) argue that the underlying propensity to commit crime is linked directly to a deficit in self-control. Self-control is a multifaceted, but unidimensional, trait that is conceptualized as a persons' ability to restrain their own behaviour, including criminal behaviour. Self-control is an individual trait that exists on a continuum for all people. Thus, according to Gottfredson and Hirschi, criminal behaviour is merely a matter of low self-control coupled with opportunity to commit crime.

Theoretical concepts.

Gottfredson and Hirschi (1990:89) also contend that there are several defining elements to the concept of self-control. These elements are the ability to delay gratification, deny easy and simple gratification, avoid taking risks, plan and maintain long term goals, develop skills, plan future activities, and be sensitive to the pain of others. Stated more plainly, those who lack or have low self-control are impulsive, insensitive, risk-takers.

[11] Many theories of the development of criminal behaviour were considered for inclusion in the present study; however, only four final theories were chosen. These theories were chosen for their sociological perspective of criminal behaviour, their extensive number of empirical validations that had been conducted in the past, their theoretical focus on the entirety of the life-course rather than specific stages of life, and finally, empirical support of the proposed theory. Two theories were strongly considered for inclusion in the present study: The Social Development Model (Catalano and Hawkins 1996; Hawkins and Weis 1985) and the Coercion Model (Patterson, Debarshye and Ramsay 1989; Patterson and Stouthamer-Loeber 1984) however, the Social Development Model was not included because the theory focussed exclusively on adolescence, and although the theory could be extended into adulthood the original authors did not do so. The Coercion Model was not included in the present study because the hypotheses of this model were not supported empirically in the reviewed literature.

They tend to focus on the present rather than the future, and they are primarily non-verbal and physical in their behaviour.

According to Gottfredson and Hirschi (1990:95), low self-control emerges from the absence of discipline and socialization by nurturing caregivers. According to the General Theory of Crime, the amount of self-control individuals develop depends on two factors: 1) how much self-control the child has as a constitutional trait; and, 2) the ability of the caretaker to recognize low self-control, based on constant monitoring and supervision, a knowledge of deviant behaviours, and the ability and desire to correct these behaviours through sanctions designed to prevent future inappropriate behaviour. Gottfredson and Hirschi (1990:96-97) argue that most children reared in this manner are able to delay gratification, empathize with others, accept restraints on their behaviour more willingly, and refrain from using violence. Overall, low self-control is caused by ineffective child rearing, which in turn leads to incomplete socialization.

The theory posits that the processes of child-rearing and socialization can go awry at any time in the early years of a child's development. Although the majority of people are well socialized by their families, Gottfredson and Hirschi (1990:99-105) note that some parents may not want their children and as such do not invest time or energy into their development and some families might be unable to supervise their children appropriately due to work duties (dual-income families), single parenthood, or the presence of many children in the home. Moreover, many parents may not recognize deviant behaviour when it occurs and, for this reason, discipline cannot occur. This lack of recognition of problem behaviour may be particularly true of parents who are themselves offenders (Gottfredson and Hirschi 1990:110). A final possibility is that the parent might recognize deviant behaviour, yet choose not to discipline the child.

Schooling may help develop self-control in those who have not developed it from proper familial socialization. In schools, teachers closely monitor a child's behaviour, and recognize deviant behaviour. Furthermore, schools tend to have more sanctions and resources to enforce discipline compared to families (Gottfredson and Hirschi 1990:105). Several major predictors of crime are linked with school (such as not doing homework, poor school performance, and not liking school), yet Gottfredson and Hirschi (1990:106) argue that the net effect of schooling on the development of self-control is positive.

Gottfredson and Hirschi contend that levels of self-control become stable around the ages of eight to 10 and "differences between people in the likelihood that they will commit criminal acts will persist over time" (Gottfredson and Hirschi 1990:107). For Turner and Piquero (2002:460), this does not mean that an individual's level of self-control does not change after a given age. They expect that as people age, their levels of self-control will likely rise; however, their ranking of self-control in comparison to others will not change. Those individuals with low self-control at age 10 will acquire higher self-control as they age, but will still exhibit lower self-control than their counterparts with higher self-control at age 10.

Gottfredson and Hirschi (1990:91-94) point to the consequences of low self-control. They note that individuals with low self-control engage in many types of behaviours that are less typical of persons with high self-control, including truancy, smoking, drinking, drug use, and criminal behaviour. Criminal behaviour is not a necessary outcome of low self-control, but Gottfredson and Hirschi (1990:90-91) contend that self-control is a "useful and reasonable concept" in the explanation of criminal behaviour, given the evidence of the stability of criminal behaviour and self-control, and the fact that self-control is temporally prior to criminal behaviour.

In a critique of existing theoretical work, Gottfredson and Hirschi contend that many theories have incorrectly explained the role of life events in the development of criminal behaviour. Many theories begin with the social events, suggesting a direct relationship between the event and the crime, and ignore the temporally prior nature of low self-control to many transitions in life and most criminal behaviour. Gottfredson and Hirschi (1990:138) argue that once self-control becomes stable, no external social events over the rest of a person's life-course will change their relative level of self-control. The authors argue that since "conventional institutions almost by definition constrain behaviour, those with little self-control are unlikely to be attracted to or influenced by them" (Gottfredson and Hirschi 1990:138). For example, individuals with low self-control are less likely to stay in school, keep a job, or maintain friendships and/or a marriage, as these social events involve self-restraint of behaviour (Gottfredson and Hirschi 1990:138-141). Overall, Gottfredson and Hirschi (1990:168) contend that situational factors ultimately do not change propensities to commit crime.

The authors also posit that the apparent negative relationship between social involvement and criminal behaviour is spurious; in reality, low self-control causally precedes both and produces both outcomes (Wright et al. 1999:481-482). Gottfredson and Hirschi (1990:141) argue that changing opportunities of crime in the face of low self-control can explain increases in criminal behaviour later in life. They further claim that only the "inexorable ageing of the organism" leads to a decrease in criminal behaviour over the life-course (Gottfredson and Hirschi 1990:141).

Discussion of gender.

The authors of *A General Theory of Crime* assert that the theory is generalizable across demographic groups and culture. Although the authors note that rates of criminal behaviour among men exceed those of women, particularly for severe criminal behaviour, they contend these differences are the manifestation of low self-control in combination with opportunity (Gottfredson and Hirschi 1990:149). They argue that although boys and girls are likely to be socialized similarly, girls are supervised more than boys and develop higher levels of self-control and have fewer opportunities to commit offences (Gottfredson and Hirschi 1990:148-149). They contend the crime differential between boys and girls is an artifact of these two factors: if one controls for level of criminal opportunity and parental supervision, level of self-control will be inversely associated with criminal behaviour similarly for both girls and boys, and women and men.

Operationalization of theoretical constructs.

Gottfredson and Hirschi (1990:220) posit that to assess the impact of self-control, one must measure this trait before criminal behaviour. Although, this trait can be operationalized in many ways, Hirschi and Gottfredson (1993:48, 53) emphasize the reliability of behavioural measures of self-control and provide several examples of adequate measures of self-control at various stages in the life-course. In childhood, there are many potential measures relating to school performance, cautiousness, temper, whining, pushing, and shoving. For adolescents, school performance, smoking, drinking, drug use, excessive television watching, accident frequency, or joyriding can all serve as indicators. In adulthood, measures of self-control might involve difficulties in personal relationships, employment stability and automobile accidents. The measurement of self-control should be multifaceted and because it is a stable trait it does not need to be

measured several times over the life-course (Gottfredson and Hirschi 1990:221-239). This implies that longitudinal studies, which are traditionally used to assess the direction of causality, are unnecessary since self-control causally precedes criminal behaviour.

Hypotheses of the theory.

Overall, one can directly hypothesize from the General Theory of Crime that individuals with lower self-control are more likely than those with higher self-control to be poorly socialized, to lack attachments to conventional society, and to be involved in crime, and that these behaviours will be stable across the life-course.

Dynamic Theories - Interactional Theory

Interactional Theory was proposed by Thornberry in 1987. Thornberry argued the need for the development of a dynamic model that examined the interactional nature of several elements of Hirschi's Bond Theory (1969) and Sutherland's Differential Association (1947). The result is Thornberry's Interactional Theory. It is a dynamic theory in the sense that past behaviour affects future behaviour. It assumes state-dependence in behaviour, proposes that different features of the model are more salient at different stages of life, and incorporates structural influences.

Theoretical concepts.

The initial concepts in the model are from Hirschi's (1969) notion of the social bond. The Interactional Theory contains six elements that account for the stage of life of adolescence. Thornberry added two additional elements to the theoretical framework to examine criminal behaviour in adulthood. Thornberry posits that attachment to parents, commitment to school and belief in conventional society act together to form a protective bond against criminal behaviour throughout the life-course (Thornberry 1996:211-218). Parental attachment refers to the affective relationship between a parent and a child; this includes style of communication, conflict between the two, and parental techniques used for discipline and supervision (Thornberry 1987:866). Commitment to school reflects the degree to which the adolescent has a stake in conventional society. According to Thornberry (1987:866), one can measure an individual's commitment to school by "success in school, perceived importance in education, attachment to teachers, and involvement in school activities." The third and final element of the bond outlined in the theory involves an individual's commitment to conventional beliefs and values. The

degree to which the adolescent has ingrained the values of "education, personal industry, financial success, and the deferral of gratification" represents this commitment (Thornberry 1987:866). Overall, an individual with strong attachment to parents, school, and conventional beliefs benefit from the protective features of their bond. Subsequently, these individuals are less likely to behave criminally. Bonds to conventional society can be weakened if any elements of the bond are individually weakened. The weakening of the bond allows the adolescent more freedom, and in turn, places them more at risk of criminal behaviour. This behaviour is contingent on and can only occur if the adolescent's bond weakens and the adolescent becomes involved with delinquent peers in a setting where delinquent values are present (Thornberry 1987:866).

Thornberry (1987:866) considers three more elements that aid in the development of criminal behaviour over the life-course. The first element is the presence of delinquent peers and the level of attachment to these peers. Second, in order to incite criminal behaviour, delinquent behaviours and values must be promoted in the peer-setting. The final element leading to criminal behaviour is the positive reinforcement of these behaviours and values by peers. Thornberry (1987:873) argues that these three elements are causally looped and reinforce the likelihood of criminal behaviour over the life-course. Accordingly, an individual with an already weak bond to society who becomes entangled in a peer group bearing the above features is more likely to become involved in crime than an individual who escapes this causal loop.

Thornberry examines how the elements in the general theory interact with one another across varying stages of life. Thornberry (1987:875) insists that these "values are not static attributes of the person, invariant over time. These concepts interact with one another during the developmental process." Not only does Thornberry view the bond as a developmental process, he also views it as a process that unfolds differently for every individual because of the multiplicity of ways the elements interact. Thornberry (2005:160) views age of onset, length of criminal career and age of desistance as continuous rather than categorical concepts, and he argues that categorizing these variables will only lead to misspecified models because there are no neat taxonomies in which to place offenders based on offending or other uniformities.

In early adolescence or before (i.e., before the age of 15), all elements of the bond to conventional society are important. The element with the most impact in these years is attachment to parents. Parents who have strong affective attachments and communicate effectively with their children are able to guide their children toward conventional beliefs, attitudes and behaviours and thus tend to raise children who are less likely to behave criminally (Thornberry 1987:874). Furthermore, these parents tend to steer their children away from delinquent friends and values, ultimately averting potential problem behaviour. Similarly, commitment to school and belief in conventional values work by decreasing the likelihood of future criminal behaviour.

Thornberry (1987:877-879) examines the interaction between elements during mid-adolescence (that is, from 15 to 16 years of age). He contends that the most salient features influencing criminal behaviour for this age group are external to the home. The centrality of attachment to parents has decreased and will continue to decrease further over the life-course. Peers are a central element in this stage of life, particularly for individuals with a social bond in settings where peers are espousing delinquent values. Upon entering this causal loop of delinquent peers, values, and reinforcement of delinquent behaviour an individual is likely to exhibit criminal behaviour.

In later adolescence, which occurs from ages 18 to 20, two new elements are added to the Interactional Theory (Thornberry 1987:879-882). The first element is commitment to conventional activities, including work, higher education or military service. The second element is commitment to family, which is a process that is just beginning and will carry out over time. These two elements are present in theory to explain desistance in criminal activities for the majority of people in the population. In this regard, age of onset of criminal behaviour is not related to the age of desistance; rather, desistance is a process in which near zero criminal behaviour is maintained regardless of length of criminal career or age of onset. Those who are committed to prosocial values and have a stake in conventional society are less likely to be involved in criminal activities and tend to desist over time (Thornberry 1987:883). In contrast, a trajectory of delinquency can lead to further weakening of social bonds and escalation of criminal behaviour over the life-course (Thornberry 1987:883).

Beyond these measures, Thornberry argues that social class is a very important antecedent factor in trajectories of the criminal behaviour over the life-course. Children from lower class backgrounds are more likely than middle class children to experience difficulties in bond development due to disrupted family processes, ill preparation for school, acceptance of non-middle class values, and a greater exposure to crime and criminals in their neighbourhoods (Thornberry 1987:884). Thornberry contends that because of difficulties in the initial stages of bond development, "lower class children should be initially less bonded to conventional society and more exposed to delinquent values, friends, and behaviours" (Thornberry 1987:885).

Discussion of gender.

Thornberry does not explicitly discuss gender. Although gender is theorized as having an exogenous impact on criminal behaviour, it is not clearly explicated how the development of criminal behaviour may differ between boys and girls. Given the nature of this theory, one might expect that the process of attachment to family, school and peers may in fact be different by gender. For example, Jang and Smith (1997:323) note that the process of detachment from family may be different for boys and girls, yet the theory does not go into this issue; however, the lack of discussion about gender implicitly suggests that the processes outlined in the theory are invariant by gender.

Operationalization of theoretical concepts.

Thornberry suggests several vague means of operationalizing the concepts in Interactional Theory. Thornberry (1987:866) contends that attachment to parents derives from several features of the relationship between a child and a parent. One can therefore assess this attachment by addressing the affective nature of the relationship, patterns of communication, parenting skills, and conflict between parent and child. Performance in school, belief in the importance of higher education, child's attachment to their teachers, and involvement in school sports or clubs can measure a child's commitment to school (Thornberry 1987:866). Attitudes toward "education, personal industry, financial success, and the ability to defer gratification" can measure an individual's commitment to conventional beliefs (Thornberry 1987:866).

Thornberry is particularly vague on the measurement of delinquent affiliation, belief in delinquent attitudes and values, reinforcement of delinquent behaviour,

commitment to conventional activities and commitment to family and social class of origin. Thornberry (1987:866) notes that measuring attachment to delinquent peers is one way to operationalize the causal loop of delinquency. Additionally, he notes that working, going to college, or entering into military service can measure commitment to conventional activities (Thornberry 1987:882). According to Thornberry and Krohn (2001:295), one can use the following constructs to measure structural adversity or social class of origin: chronic poverty, unemployment, welfare dependence and residence in areas of concentrated poverty. Overall, Thornberry is very vague about the operationalization of the concepts proposed in the Interactional Theory.

Hypotheses of the theory.

Over the years, Thornberry has outlined several hypotheses. The first hypothesis is that conventional beliefs have a primarily weak effect on delinquency (Thornberry 1996:229). More recently, Thornberry (2005:176) suggests that protective causal factors such as attachment to family, commitment to school, and belief in conventional values will lessen the impact of delinquent opportunities, friends, and beliefs, making any criminal behaviour from individuals in this group increasingly less likely. In contrast to the General Theory of Crime, the Interactional Theory does not focus on individual traits as the main cause of criminal behaviour. Rather it emphasizes changing social factors over the life-course and examines how these changes affect individual criminal behaviour.

Combination Theories - Dual Taxonomy

Over the past decade, Moffitt has developed the Dual Taxonomy of Offenders to explain the development of criminal behaviour over the life-course. This theory focuses on two different types of offenders, with the combination of these two groups explaining the tails and the peak in mid-adolescence of the age-crime distribution.

Theoretical concepts.

More specifically, the first offending group produces the two tails of the curve: life-course-persistent offenders. Moffitt (1997:13-14) argues that this small group of individuals partake in offending across all stages of the life-course. This group begins offending in childhood, and their offending persists through adolescence and continues into adulthood. Continuity in offending is the main feature of this group.

The second group accounts for the peak in the aggregate age-crime curve in mid-adolescence, which marks their initiation of offending. This large group has been labelled the adolescent-limited offenders (Moffitt 1997:15-16). These individuals do not offend at early points in the life-course; rather, they begin offending around the age of 15 and desist from offending in early adulthood (around age 18). Discontinuity in offending over the life-course characterizes the adolescent-limited offenders.

According to Moffitt, these two groups differ not only in terms of offending trajectories, but also in terms of the causes of their particular trajectories. Moffitt (1997:17, 24) theorizes that life-course-persistent offenders have neuropsychological deficits from birth and these deficits manifest themselves in problems of "verbal and executive function," such as difficulties with reading, writing, speech, listening, problem-solving, memory, attention and delayed gratification (Moffitt 1993:680). The family environment can further exacerbate these deficits. Families of children with neuropsychological deficits often lack the resources and the ability to deal with the needs of these children (Moffitt 1993:681). Neuropsychological deficits coupled with difficult environments can lead to difficulty in school and subsequent problems for these children.

According to Moffitt (1997:21), continuity in offending results from contemporary or cumulative consequences. The first type occurs when childhood deficits of the life-course-persistent offenders continue. These deficits are often linked to a specific behavioural pattern such as lack of ability to control temper and can manifest differently but persist over the life-course (Moffitt 1993:679). The second type results from the deficits of early childhood leading to further difficulties and the accumulation of a range of problems at all stages of life, such as the inability to learn and practice appropriate prosocial behaviour and the social difficulties that arise from criminal behaviour (Moffitt 1993:683). Overall, the trajectory of criminal behaviour for life-course-persistent offenders begins in childhood and persists through mid-adulthood.

Moffitt (1997:22) contends that the cause of criminal behaviour in adolescent-limited offenders is different from that of life-course-persistent offenders. Moffitt argues that due to a prolonged period of adolescence, in which social age is stalled in the face of increasing biological age, many contemporary adolescents feel "trapped in a maturity gap" (Moffitt 1997:26). Simultaneously, adolescent-limited offenders notice their own

inability to move into adulthood and the small group of life-course-persistent offenders who have gained relative independence (i.e., whom the maturity gap does not affect) (Moffitt 1997:27). The adolescent-limited offenders then model the criminal behaviours of the life-course-persistent offenders in an attempt to gain their independent lifestyles (Moffitt 1997:31). Generally, this modelling occurs from mid-adolescence to early adulthood. As the adolescent-limited offenders enter adulthood, they desist from criminal behaviour because they can now access legitimate opportunities to gain independence (Moffitt 1997:35). Furthermore, because they do not have the deficits typical of life-course-persistent offenders, they do not suffer from contemporary or cumulative consequences (Moffitt 1997:37). Overall, these features of adolescent-limited offenders make their patterns of offending discontinuous and lead to a desistance from criminal behaviour in adulthood that does not occur for life-course-persistent offenders.

Life-course-persistent and adolescent-limited offenders are theorized to have different causes and patterns of criminal offending. Moffitt (1997:13-16) contends that adolescent offenders have a limited scope of offending behaviours compared to life-course-persistent offenders. She notes that adolescent-limited offenders are more likely to participate in offences that symbolize independence, such as vandalism, substance use or running away; in contrast, life-course-persistent offenders will participate in many offences, including violent criminal acts (Moffitt 1997:40-41).

Moffitt also draws attention to a very small group of individuals who are non-delinquents throughout the life-course. She theorizes that these individuals do not behave criminally either because they do not feel the pressure of the maturity gap, do not have life-course-persistent offenders to model or they do not have opportunities to engage in activities with delinquents due to personal characteristics (Moffitt 1997:41).

Recently, there is evidence of another group of offenders, which has been labelled low-level chronics. Moffitt (2006:577) notes that these individuals persistently offend at low levels inconsistently over the life course. Generally, there is consistency in offending over the life-course for this group (Moffitt 2006:577). Low-level chronic offenders tend to be socially isolated and have mental health issues (Moffitt 2006:577-578). For these reasons, low-level chronics tend to avoid much of the suffering that comes from cumulative consequences (Blokland, Nagin and Nieuwbeerta 2005:922).

Discussion of gender.

Moffitt addresses gender differences in criminal behaviour over the life-course. She contends that the Dual Taxonomy addresses the gender gap in criminal behaviour (Moffitt 2006:588). She contends that, unlike boys, most girls do not exhibit neuropsychological deficits, which accounts for the lack of life-course-persistent offenders among females (Moffitt 2006:588). Girls are as likely as boys to begin offending in adolescence, nonetheless, girls' rates of criminal behaviour may be slightly lower than those of boys during this period of the life-course because they are have fewer opportunities to learn antisocial behaviour because of less access to delinquent peers. In addition, girls may perceive the personal risk to be higher than that of their male counterparts (Moffitt 2006:588-90).

Operationalization of Theoretical Concepts

Although Moffitt is vague about the operationalization of many of the variables described, she does provide some suggestions as to the measurement options relating to Dual Taxonomy. First, a test of the theory requires measures of behaviour prior to adolescence in order to distinguish between life-course-persistent and adolescent-limited offenders (Moffitt 1993:678). Secondly, Moffitt (1993:678) notes that one should measure the behaviours of both types of offenders longitudinally to truly assess how trajectories differ from one another over the life-course. In childhood, Moffitt suggests several ways to measure neuropsychological deficits. Testing language ability or ability for self-control, is a way to measure these deficits (Moffitt 1993:681). Nagin, Farrington and Moffitt (1995:116) suggest that IQ and school attainment are also a good measure of these deficits. Overall, however, Moffitt contends that "health, gender, temperament, cognitive abilities, school achievement, personality traits, mental disorders (e.g. hyperactivity), family attachment bonds, child rearing practices, parent and sibling deviance, and socioeconomic status, *but not age*" are the best predictors of life-course-persistent offending; while the best predictors of adolescent-limited offending are "knowledge of delinquent peers, attitudes toward adulthood and autonomy, and cultural and historical context, and *age"* (Moffitt 1993:695). Although her suggested measures are vague, they do offer direction on to how to operationalize the concepts of the Dual Taxonomy for the purposes of empirical testing.

Hypotheses of the theory.

Several hypotheses can be derived from the Dual Taxonomy. First, life-course-persistent offending is due to an interaction between neuropsychological problems and family risk factors (Moffitt 2006:572-574). Second, those without peers do not participate in criminal activities because they do not have opportunities to engage in activities with delinquent peers (Moffitt 2006:581-582). Finally, low-level chronics persist in criminal behaviour over the life-course due to neuropsychological deficits; however, they do so at a low rate due to social isolation (Moffitt 2006:578).

This theory is unlike other theories of criminal behaviour, Moffitt (1993:674) argues, in that different patterns of offending are produced by different groups of offenders, with the cause of offending being unique to each group. This theory combines several components of previously discussed theories, particularly the General Theory of Crime. For instance, both of these theories start with a trait. In the Dual Taxonomy, this trait is neuropsychological health, which exhibits a normal distribution across the general population; the General Theory of Crime hypothesizes the trait of self-control also has a normal distribution. Moffitt (1993:694) argues, however, that a "psychological trait only" theory such as Gottfredson and Hirschi's is insufficient to explain criminal behaviour because it cannot account for desistance. This criticism has been noted by other authors of dynamic theories of criminal behaviour by including social environment and events over the life-course (e.g., Sampson and Laub 2003, 2003a; Uggen and Kruttschnitt 1998). Similarly, the Dual Taxonomy considers the interaction between personality traits and social environment to account for differential patterns of offending. Moffitt notes that life-course-persistent offenders are in a "constant process of reciprocal interaction between personality traits and environmental reactions to them" (Moffitt 1993:684), while adolescent-limited offending is a social process that many individuals enter and eventually exit. The Dual Taxonomy, similar to the Interactional Theory, argues that some social events act as transition points in patterns of offending; however, Moffitt also notes that social events can also be related to continuity in offending (Moffitt 1997:41).

Overall, the Dual Taxonomy combines elements of static and dynamic theories. The life-course-persistent offender exemplifies the static portion of this theory, while the adolescent-limited offender represents the dynamic portion. The trajectories of adolescent

offenders are state-dependent in the sense that prosocial behaviour in early adolescence aids in the return to prosocial behaviour in early adulthood and their desistance from criminal behaviour often coincides with the transition from adolescence to adulthood.

Combination Theories – Age-graded Theory of Informal Social Control

In 1993, Sampson and Laub proposed the Age-graded Theory of Informal Social Control to account for criminal behaviour over the life-course using both static and dynamic measures. This integrated theory applies concepts proposed by Elder (1985) such trajectories, transitions, and turning points to criminal behaviour.

Theoretical concepts.

Sampson and Laub (1993) apply the principles of social control theory to the development of criminal behaviour over the life-course. The age-graded theory focuses on informal sources of social control. Sampson and Laub (1993:18) note that informal social controls "emerge from the role reciprocities and structure of interpersonal bonds linking members of society to one another and to wider social institutions such as work, family and school." They argue that an individual behaves criminally when the interpersonal bond between an individual and society is weak or non-existent. Sampson and Laub (1993:18) contend that the social bond to society changes with age and social development and so do the sources of formal and informal social control. Formal types of social control tend to be prominent in the lives of children such as family and school whereas in adulthood informal sources of social control tend to be more important such as a job or a marriage.

Additionally, Sampson and Laub (1993) argue that social capital must also be considered as a source of social control in the study of trajectories over the life-course. Strong and interdependent social relationships are a form of social capital. These relationships are a resource that individuals "can draw on as they move through life transitions that traverse larger trajectories" (Sampson and Laub 1993:18-19). Thus, Sampson and Laub (1993:18) argue that as social relationships change, and in turn social capital changes, we can expect changes in criminal behaviour as well. For example, as social capital increases, we would expect to see decreases in criminal behaviour. Predominantly, the theory examines how the bond between individuals and social institutions (i.e., social control) vary over time and how this variation affects levels of

formal and informal social control experienced by an individual, which in turn has an impact on the likelihood of criminal behaviour.

Sampson and Laub (1993:243) draw attention to three areas in their life-course explanation of criminal behaviour. First, they note that criminal propensities play a role in the continuity in criminal behaviour over the life-course. Second, they hold that family and school sources of social control in childhood, and to a lesser degree in adolescence, mediate structural factors. Finally, they posit that the informal social control and social capital experienced during adulthood explain changes in criminal behaviour regardless of differences in criminal propensity and structural factors.

In examining childhood (ages 0 to 10), Sampson and Laub (1993:20) contend that structural factors have an indirect impact on the development of criminal behaviour over the remainder of the life-course. They theorize that processes of social control in the family, school, and among peers mediate structural factors such as family socioeconomic status, size of family, and disruption of the family. They posit that these structural factors affect the development of criminal behaviour over the early part of the life-course (ages 0 to 17). For example, low family socioeconomic status, large family size, experience of family disruption, high levels of residential mobility, deviant behaviour of parents, living in a crowded house, having parents who were foreign-born, and having a mother who works outside the home all increase the likelihood of delinquency in childhood and adolescence and criminal behaviour in adulthood.

Similar to static theories of criminal behaviour, Sampson and Laub (1993:88-89) contend that individual differences in constitution affect criminal behaviour over the life-course. They argue that children who have difficult temperaments, persistent tantrums, or early conduct disorder are more likely than individuals without these difficulties to have delinquent outcomes in childhood or adolescence. Unlike the static theorists Gottfredson and Hirschi (1990), however, they argue that the processes of social control and social bonds developed after age 17 can mediate criminal propensities. Processes of social control can positively influence criminal propensity through the development of social capital and increases in sources of formal and informal social control over the life-course leading to decreases in criminal behaviour.

Social control processes and delinquent influences are theorized to directly influence criminal behaviours in childhood and adolescence. Up to age 17, two social institutions are central to the social control process: the family and school. The family socially controls the behaviours of children several ways. Sampson and Laub (1993:82) note that attachment between child and parent, discipline, and lack of supervision affect the development of criminal behaviour. Children who are accepted, rather than rejected, by their parents and form proper attachments to their parents are less likely to behave criminally. Additionally, harsh and erratic discipline is positively associated with and has a lifelong impact on the development of criminal behaviour. Supervision also affects the likelihood of children engaging in criminal behaviour over the life-course, as children whose activities are monitored are less likely to behave criminally.

Sampson and Laub (1993:104) contend that school attachment is negatively associated with criminal outcomes. The more attached individuals are to the institution of school the less likely they are to engage in criminal behaviour. Furthermore, they argue that individuals who perform poorly at school are more likely to engage in criminal behaviour over the life-course. This is likely due to a lack of social capital, which in turn increases the likelihood of criminal behaviour.

Association with delinquent peers is theorized to affect the development of criminal behaviour during the childhood and adolescence stages of life. Sampson and Laub (1993:109) speculate that association with delinquent peers increases criminal behaviour over the life span; however, they further contend that the processes of social control in the family and school have a larger influence the development of criminal behaviour than the association with delinquent peers. Each of these theoretical elements, the social processes of the family and school, and association with delinquent peers, has a direct impact on criminal outcomes in childhood and adolescence.

One of the most consistent findings about criminal behaviour is its continuity over the life-course. Sampson and Laub (1993:246) contend that the weak social bonds and lack of social capital that lead to delinquency in earlier life persist into adulthood and directly affect the likelihood of future criminal behaviour. Furthermore, Sampson and Laub (1993:248) contend that delinquency increases the likelihood of involvement with the system of criminal justice, which further weakens social bonds. The weakening of

social bonds and social capital increases the likelihood of criminal behaviour in the future. Sampson and Laub (1993:165) labelled this process "cumulative disadvantage." Delinquency in adolescence, especially if it leads to incarceration, leads to a cascading effect that limits prosocial opportunities such as employment in adulthood (Sampson and Laub 1993:248). The limiting of these prosocial opportunities removes chances for delinquent youth to develop the social bonds and social capital in adulthood, which could have led to decreases in future criminal behaviour. Stability can also occur on a prosocial trajectory. Youth who have not engaged in criminal behaviour in earlier years and are able to maintain strong social bonds and social capital during the transition into adulthood.

The transition from earlier life into adulthood produces a change in the sources of social control and social capital. Important changes in the ability to bond socially and access social capital can mark the transition from childhood and adolescence to adulthood. Sampson and Laub (1993:224) contend that marital relations and labour force participation are the two most significant sources of informal social control after the age of 17. Additionally, the presence of children can act as a source of informal social control (Sampson and Laub 1993:18). Accordingly, strong martial attachment, job stability, and the presence of children inhibit criminal behaviour in adulthood (Sampson and Laub 2003:248; Sampson and Laub 1993:56). These informal social bonds can change the trajectory of criminal behaviour in two significant ways: the initiation of or the desistance from criminal behaviour in adulthood (Sampson and Laub 1993:246). An individual who has not previously engaged in criminal behaviour in earlier life may initiate criminal behaviour in adulthood due to a decrease in the sources of formal social control and/or an inability to develop social capital, leading to few sources of informal social control. In contrast, the development of strong social bonds (e.g., marriage or employment) in the transition to adulthood leads to desistance from criminal behaviour. Sampson and Laub (1993:18) contend that any change in social bonds and social capital can act as turning points in criminal behaviour. This dynamic theory proposes that time-varying turning points, and changes in social bonds and capital, directly influence criminal behaviour over the life-course, especially in adulthood.

Discussion of gender.

As noted above, Sampson and Laub (1993) theorize that one's position in the social structure, including one's gender, has an indirect impact on criminal behaviour. Although not explicitly discussed in the main theoretical outline,[12] Mason and Windle (2002:479) argue that the social processes and mechanisms involved in the initiation, persistence and desistance of criminal behaviours are systematically different for males and females. In terms of the initiation and persistence of criminal behaviour, Giordano, Cernkovich and Rudolph (2002:1052) note that certain social processes appear to have the same impact on the criminal behaviour of both males and females, such as social class, lack of parental supervision, poor performance in school, and attachment to delinquent peers. They argue that the different social position of women as compared to men may lead to differing desistance processes, despite similar reasons for desistance of criminal behaviour among men and women. For example, they note that women are more likely to have strong familial attachments and to derive status through marriage rather than occupation compared to men. Giordano et al. (2002:996) hypothesize that for these reasons both marriage and child rearing will have a greater impact on the desistance of criminal behaviour by women more so than by men. Further, they contend that employment experiences will be more important in the desistance of criminal behaviour of men. The lack of discussion about gender on the part of Sampson and Laub suggests that the theorized social processes should be invariant by gender; however, authors such as Giordano et al. (2002) contend that this is not the case.

Operationalization of theoretical constructs.

Sampson and Laub (1993) provide many ways to operationalize the key elements of their theory. Many measures of structural factors are included (see Sampson and Laub 1993, 71-73). The measurement of household crowding used three categories: comfortable (parents and children have separate rooms), average (two people to a bedroom), and overcrowded (more than two people to a bedroom excluding infants). Whether a two-parent home changed to another form or family structure measured disruption in family. Size of family was a continuous variable based on the number of children in the family.

[12] The Age-graded Theory of Informal Social Control was developed using a sample of white male offenders. Thus, gender was not discussed. This sample may limit the generalizability of the theory.

The measurement of the socioeconomic status of the family used a categorical variable that combined information on average weekly income and any reliance on outside aid. This theory also considers whether parents were immigrants. The operationalization of residential mobility consisted of the number of times that an individual moved. The employment situation of the mother was also considered a structural factor and was measured by whether or not a mother worked outside the home. The final two structural factors examine the general deviance of parents. Whether either parent had arrest or conviction records measured the criminal history of parents. Additionally, whether either parent engaged in chronic episodes of intoxication comprised the measure for alcoholism of parents.

Additionally, Sampson and Laub (1993:88) theorize constitutional traits as antecedents affecting criminal behaviour. Three measures tapped constitutional traits: child difficulty, the presence of temper tantrums, and early-onset of conduct disorder. Whether or not a child was overly restless or irritable measured child difficulty. Whether the child often acted violently captured the presence of temper tantrums. Finally, an examination of whether the child had engaged in delinquency before the age of eight measured the early-onset of conduct disorder.

Sampson and Laub (1993:73-74) also provide clear ways to measure processes of social control through the family and school during childhood. Three elements are theorized to have an impact on the social control process of the family: lack of supervision, harsh and erratic discipline, and parental rejection. Mother's ability to supervise the child's behaviour at home or in the community comprised the operationalization of lack of supervision. Harsh and erratic discipline entailed a combination of three techniques of discipline used by parents: use of corporal punishment accompanied with hostility/rage, discipline that elicited fear in the child, and whether the parent was consistent in enforcing rules. Whether parents were openly hostile or neglectful toward their child measured the rejection of child by parent.

Two ways to measure the social processes of school are provided by Sampson and Laub (1993:106). Whether the child had a favourable attitude toward school, as well as the academic aspirations of the child, measured attachment to school. The second

measure to assess school performance used information about the child's grades from the previous year and the number of times they did not complete a grade successfully.

The operationalization of delinquent influences included two measures: attachment to delinquent peers and attachment to delinquent siblings (Sampson and Laub 1993:107-108). Attachment to delinquent peers was measured by whether the child had any delinquent friends and how highly attached they were to these friends. The same technique assessed whether or not the child was attached to a delinquent sibling.

Sampson and Laub operationalize informal social control in adulthood by examining attachment to labour force and romantic partner. A combination of job stability and occupational attainment measured attachment to labour force (Sampson and Laub 1993:144). The length of time employed in the current job captured job stability and whether the individual had high education, work, or economic aspirations in adulthood measured occupational attainment. Attachment to spouse was measured by examining whether there had been periods of brief separation, as well as attitudes regarding marital responsibility and general conjugal relations. Overall, the concepts in the Age-graded Theory of Informal Social Control as operationalized by Sampson and Laub (1993) are clear and concise.

Hypotheses of the theory.

Sampson and Laub (1993:7) also draw clear hypotheses from their theory. First, they hypothesize that structural factors and constitutional traits are mediated by family and school sources of social control in childhood and to a lesser degree in adolescence. The second hypothesis derived from this theory is that family and school social control processes that develop social bonds and provide formal sources of social control decrease the likelihood of criminal behaviour over the life-course. Additionally, they hypothesize associations with delinquent peers positively affect criminal behaviour over the life-course. Their final hypothesis is that marital attachment and job stability inhibit criminal behaviour in adulthood. The general hypothesis drawn from this theory is that if an individual experiences an increase in social capital and social bonds over the life-course, then involvement in criminal behaviour will decrease regardless of constitutional traits and previous criminal involvement.

The Age-graded Theory of Informal Social Control as proposed by Sampson and Laub (1993) combines aspects of static and dynamic theories of criminal behaviour in a manner that is quite different from the previously discussed theories. Unlike the Dual Taxonomy, which develops typologies of offenders, the Age-graded Theory of Informal Social Control does not use typologies. This is due to the time-varying nature of the opportunities to increase social bonds. Individuals can experience these opportunities at different time points and therefore it is not useful to categorize people based on the timing of these opportunities. As with Thornberry, Sampson and Laub (2003:112) contend that this is the reason that typologies of offenders based on childhood traits and experiences are poor predictors of criminal behaviour in adulthood.

Unlike some of the theories discussed earlier, Sampson and Laub (1993) developed a theory that simultaneously accounts for the initiation and desistance of offending over the life-course. This is a particular strength of the theory.

Although the Age-graded Theory of Informal Social Control has notable theoretical differences from other theories of criminal behaviour over the life-course, it also has striking similarities. This model has static features that are similar to the Dual Taxonomy and the General Theory of Crime. All of these theories contend that certain traits early in childhood predispose individuals to criminal behaviour; however, unlike the Dual Taxonomy and the General Theory of Crime, the Age-graded Theory of Informal Social Control contends that informal social controls in adulthood affect these constitutional traits and change trajectories of criminal behaviour. Additionally, many of the constructs put forward in these theories are similar.

Empirical Validation of Theories of the Development of Criminal Behaviour over the Life-course

The body of literature examining the development of criminal behaviour over the life-course is immense: over a thousand articles have been identified. The aim of this section is to examine the empirical literature that tests the main hypotheses of each of the above-mentioned theories. A large proportion of these studies included research with a focus on delinquency and norm-violation. Although behaviours classified as delinquent or norm violating may be age appropriate for children and adolescents, this concept does not apply over the life-course. Thus, the literature review is limited to behaviours classified

as being criminal in adulthood, such as theft, arson, and illicit drug use.

Generally, two approaches can be used when examining the empirical validity of a theory. The first approach consists of an examination of the studies that have tested the tenets of the theory. This allows an opportunity to assess the number of studies that empirically validate the theory in comparison to those studies that do not. Further, this style of examination allows for general patterns of evidence to be developed. For example, are all of the tenets of the theory met or are only certain tenets valid?

A second way to empirically validate theories is through an examination of the body of literature for trends suggesting that the validity of the findings may vary based on design of research (e.g., measurement of concepts and outcomes, length of follow-up period, inclusion of other theories, and type of sample). Variations in the strength of evidence supporting a theory across designs of research may suggest that a theory may not reflect the social processes for which it was developed or that it may not apply across social groups. This secondary analysis of empirical validation provides a different outcome from a general examination of the proportion of studies lending evidence in support of the proposed theory. The current review of literature uses both styles of examination of empirical evidence in testing the validity of the proposed theories.

Initially, a simple categorization technique assessed whether a study provided evidence in support of a theory. Several aspects of an empirical test of a proposed theory were considered. Studies meeting certain criteria were classified as having produced evidence in strong, moderate or weak support of the theory. Studies that did not meet these criteria or had produced evidence contrary to proposed theories were considered to provide no support for the proposed theories. The following criteria were examined: model specification of the proposed theory, model fit and effect size, findings that reflect the proposed hypotheses regarding structural relationship, and maintenance of hypothesized findings when other theories are considered.

First, to be a strong test of the theory, a complete examination of all constructs of the theory must be conducted in a single model. Any other tests are considered partial tests; the fewer constructs examined in a study the more likely it will be considered in weak support of the theory.

Second, for a study to provide strong support of the theory, the accuracy of the proposed model can be assessed by examining the differences between the observed values and the predicted values (Hosmer and Lemeshow 2000:143). If there are few differences between what is observed and predicted, the estimated model is considered a good representation or "good fit" of the observations collected in the data. If the model fit is poor, whether for the entire sample or specific subpopulations of the sample such as race or gender, then the study would be considered to provide weak support for the theory at best. Although the ability to assess model fit depends on the type of statistical analyses, normally, each type of technique provides a manner through which one can assess strength of evidence. For example, one could examine the amount of explained variance with an OLS regression to assess the explanatory power of a theory.

Third, in many of the proposed theories several pathways or structural relationships were hypothesized. Therefore, studies that provided evidence of all paths being significant and in the expected directions are considered to be in strong support of the theory. If all paths are not significant or in the expected direction of the theory, the degree to which the structural relationships appear to deviate from the proposed theory leads to a decrease in the level of support according to which the study is classified. Only studies with the slightest structural deviations are considered in moderate support of the proposed theories; others are considered weak.

Finally, evidence was only considered to be in strong support of the theory when size of effect and significance of central constructs was maintained when variables from competing theories were included in the model being tested. The estimates associated with the central constructs being tested should not substantially decrease in size of effect or significance with the introduction of other variables. Otherwise, a study was considered to be of weak or no support for the proposed theory. Studies lacking all of the above-mentioned criteria were considered to provide no support for the proposed theory.

After studies were classified according to the strength of evidence provided through the empirical validation of the theory, a higher-level examination was conducted to ensure that validity of the theory was not related to design of the research. This examination allows us to ensure that for the majority of studies providing empirical evidence in support of the theory other factors were not fuelling these findings.

Specifically, the categories of strength of support were examined across aspects of research design such as measurement of concepts and outcome, length of follow-up period, consideration of other theories, and type of sample. Accordingly, where strength of support is not related to these items, it generally suggests that the tenets of each of the theories are empirically valid; however, if great variations between categories are observed it can suggest that propositions of a theory may not hold in all cases and may not reflect a general process of the development of criminal behaviour. These variations must be considered when assessing the empirical validity of proposed theories.

Empirical Support of the General Theory of Crime

Strength of support.

Eighty-three studies that test for an inverse relationship between self-control and criminal behaviour, as proposed by the General Theory of Crime, were identified using several relevant databases of literature. None of these studies produced strong evidence in support of the General Theory of Crime, due to the low amount of variance accounted for by self-control with respect to outcomes. Yet, relatively few provided no evidence of a relationship between self-control and criminal behaviour (e.g., Alvarez and Fox 2010; Redmon 2003; Krauss et al. 2000; Forde and Kennedy 1997).

Forty-seven studies[13] provided weak support for the theory (see Appendix A). These studies varied greatly in their methods, sample, and measures of self-control and criminal behaviour, yet they all provide evidence of negative association between self-control and criminal behaviours. Another 33 studies[14] provide moderate support for the

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[13] see Cheung and Cheung (2010); Holtfreter et al. (2010); Moon, McCluskey and McCluskey (2010); Conner, Stein and Longshore (2009); de Kemp et al. (2009); McGloin and Shermer (2009); Miller et al. (2009); Cheung and Cheung (2008); Cretacci (2008); DeLisi and Vaughan (2008); Higgins, Fell and Wilson (2007); Jones, Caufmann and Piquero (2007); McCartan and Gunnision (2007); Burt, Simons and Simons (2006); Langton, Piquero and Hollinger (2006); Morris, Wood and Dunaway (2006); Ribeaud and Eisner (2006); Unnever, Cullen and Agnew (2006); Winfree et al. (2006); Cauffman, Steinberg and Piquero (2005); Chapple (2005); Piquero, MacDonald et al. (2005); Vazsonyi and Crosswhite (2004); Vazsonyi et al. (2004); DeLisi, Hochstetler and Muprhy (2003); Peter, LaGrange and Silverman (2003); Romero et al. (2003); Mason and Windle (2002); Simpson and Piquero (2002); Stylianou (2002); Hay (2001); Wright et al. (2001); Nakhaie, Silverman and LaGrange (2000); Piquero, Macintosh and Hickman (2000); Junger and Tremblay (1999); Sellers (1999); Wright et al. (1999); Burton et al. (1998); Longshore and Turner (1998); Piquero and Rosay (1998); Longshore, Turner and Stein (1996); Piquero and Tibbetts (1996); Tibbetts and Herz (1996); Sorensen and Brownfield (1995); Tremblay et al. (1995); Brownfield and Sorensen (1993).

[14] see Shekarhar and Gibson (2011); Meldrum, Young and Weerman (2009); Piquero, Moffitt and Wright (2007); Higgins and Tewksbury (2006); Blackwell and Piquero (2005); Cleary (2004); Longshore et al. (2004); Perrone et al.(2004); Baron (2003); Chapple and Hope (2003); Tittle, Ward and Grasmick (2003);

theory. Again, these studies involved differing methods; however, they indicated a moderate and inverse relationship between self-control and criminal behaviour. Overall, the proportion of studies producing evidence supporting the propositions of the General Theory of Crime suggests its empirical validity. The theory provides a reasonable explanation of criminal behaviour, which is reflected by the relatively large number of studies providing a positive validation. A more detailed examination, however, may call into question the empirical validity of the theory.

Measurement of constructs.

First, an examination of the operationalization of the construct of self-control and the outcome measures by strength of support was conducted. The studies generally employed an attitudinal measure of self-control; in fact, approximately half of the studies used the self-control scale developed by Grasmick et al. (1993). As suggested by Gottfredson and Hirschi (1990), some studies made use of behavioural measures of self-control. According to Pratt and Cullen (2000:946), who conducted a meta-analysis of 21 studies testing the General Theory of Crime, the impact of low self-control did not vary by the type of measure of self-control used (i.e., attitudinal vs. behavioural). Similarly, this is the case with the 83 studies examined in this literature review; the level of support for this theory did not appear to be dependent on the type of self-control measure used.

The operationalization of criminal behaviour also differed across studies. The range of behaviours measured as outcomes is quite broad. For example, the outcomes used varied from the intention to commit crimes (such as shoplifting, drinking and driving, and theft), to engaging in criminal behaviours (such as general delinquency scales, property crimes, drug crimes, serious anti-social behaviour, violent crimes, and homicide), to whether an individual had been previously arrested or convicted. The General Theory of Crime appeared to apply equally to all criminal behaviours. Taken together, these findings provide more support in validating the theory.

Unnever, Cullen and Pratt (2003); Vazsonyi (2003); Higgins (2002); Shreck (2002); Turner and Piquero (2002); Delisi (2001); Delisi (2001a); Vazsonyi et al. (2001); Gibson, Wright and Tibbetts (2000); Lynskey et al. (2000); Burton et al. (1999); Henry et al. (1999); Lagrange and Silverman (1999); Avakame (1998); Deng and Zhang (1998); Longshore (1998); Evans et al. (1997); Vazsonyi (1996); Burton et al. (1994); Polakowski (1994); Grasmick et al. (1993); Keane, Maxim and Teevan (1993); Nagin and Paternoster (1993).

Research design.

Studies also differed in terms of type of design, only 18 of 80 studies were longitudinal in nature (see Appendix A). As noted by Pratt and Cullen (2000:946), it appears that longitudinal studies included in the present literature review provide slightly weaker evidence for the General Theory of Crime than cross-sectional research. The overall support of evidence for the theory regardless of the design of research provides an additional type of support of the validity of the theory.

The studies vary in terms of whether the constructs of competing theories are included in the test of the theory. Issues with model specification are important because Gottfredson and Hirschi argue that only opportunity and self-control are required to account for criminal behaviour. They contend that self-control and opportunity fully mediate any relationship between social variables and criminal behaviour; however, this hypothesis has found little support. Pratt and Cullen (2000:948) note that the indicators of competing theories were not fully mediated by the presence of self-control. Similarly, in the present literature review, the majority of studies that included measures of competing theories indicate that the variables of opportunity and self-control did not fully mediate the relationship between variables from competing theories and criminal behaviours. The combination of evidence from Pratt and Cullen (2000) and the studies reviewed here suggests that the General Theory of Crime may not, in fact, be the only empirically valid theory concerning the development of criminal behaviour, or, worse yet, it may not be an empirically valid reflection of the development of criminal behaviour.

Finally, an examination of strength of support was completed by considering type of sample. The samples used across studies are quite different. Generally, five types of samples were used to test the relationship between self-control and criminal behaviours: adults and youth from the general population, adult and youth offenders, and college students. Effect sizes did vary across the groups examined. For example, studies using adults from the general population tended to report higher effect sizes than other studies. Pratt and Cullen (2000:947) reported similar findings. The magnitude of the effect appears to be dependent on the type of sample suggesting that the General Theory of Crime may explain the development of criminal behaviour better among some groups than others, which questions its generality; nonetheless, self-control was significantly

related to criminal behaviours in all the groupings, which supports the generality of the theory.

Gender differences.

The lack of generality of the theory is especially apparent when examining the effects of self-control by gender. In proposing the General Theory of Crime, theorists contended that the effects of self-control on criminal behaviour are invariant by gender (assuming equal opportunities for criminal behaviour between the sexes). The theorists did hypothesize, however, that males would have lower self-control and more opportunities to commit crimes compared to females, and in turn have higher rates of criminal behaviour due to differences in the supervision of males and females. Twenty-one of the studies included examine self-control by gender (i.e., tested an interaction model of gender and self-control or conducted separate analyses by gender) (see Appendix A). Ten of these studies provided evidence against the hypothesis of gender invariance, and the other 11 produced at least weak support for this hypothesis. The evidence supporting the hypothesis of gender invariance is weak at best; however, this evidence seems to be dependent on the type of study conducted.

Generally, the studies that have examined differences by gender regarding the General Theory of Crime have either examined the impact of gender on the measure of self-control itself and/or a predictive test of the self-control hypothesis. Seven of the identified studies assessed the measurement of self-control among males and females. More specifically, these studies (Ribeaud and Eisner 2006; Vazsonyi et al. 2004, 2001; Piquero et al. 2000; Lagrange and Silverman 1999; Piquero and Rosay 1998; Longshore et al. 1996) investigated patterns of response of males and females on self-control scales.[15] Three of these studies provide evidence that males and females respond similarly to measures of self-control. For example, Vazsonyi et al. (2001, 2004) report that the factor structures for both males and females did not significantly differ across samples from several countries (the United States, Netherlands, Switzerland, Hungary (Vazsonyi et al. 2001:119), and Japan (Vazsonyi et al. 2004:208)). Moreover, using the same data as Longshore et al. (1996), Piquero and Rosay (1998:169) report that the factor structure of

[15] With the exception of the study completed by Lagrange and Silverman (1999), all used the attitudinal scale of Grasmick et al. (1993) to measure self-control.

the self-control scale did not vary by gender. These three studies suggest that measurement of the proposed concept of self-control did not differ by gender. These findings support the contention of Gottfredson and Hirschi (1990) that this concept does not vary by demographic characteristics.

The evidence from the other four studies, however, suggests that the structure of the concept of self-control does vary by gender. Longshore in 1996 and in an 1998 rejoinder to Piquero and Rosay, found that the factor structure of Grasmick et al.'s (1993) measure of self-control differed by gender suggesting that this popular attitudinal measure of self-control may not reflect the original concept of self-control as proposed by Gottfredson and Hirschi (1990) among women. Similarly, Lagrange and Silverman (1999) and Ribeaud and Eisner (2006:48) respectively noted gender differences in risk-taking, impulsivity and simple task dimensions of self-control. Finally, Piquero et al. (2000:921) find that gender had an impact on responses to the Grasmick et al. (1993) measure of self-control. Piquero et al. (2000:921) contend that role expectations may influence the manner in which males and females respond to the items in the scale independent of their level of self-control. These differences in the patterns of response of males and females found by Ribeaud and Eisner (2006), Piquero et al. (2000), Lagrange and Silverman (1999), and Longshore et al. (1996) call into question whether the scales used to measure self-control reflect the original concept that was proposed to be unvarying by gender.

Several studies examining the ability of measures of self-control to predict criminal behaviour provided evidence of differences by gender as well. Eight studies provided support against the invariant impact of self-control by gender (see Appendix A). The studies by Shekarhar and Gibson (2011), Higgins and Tewksbury (2006), Blackwell and Piquero (2005), Henry et al. (1999), Lagrange and Silverman (1999), Burton et al. (1998), Longshore and Turner (1998), and Tibbetts and Herz (1996) provided evidence that the impact of self-control varied by gender. First, Longshore and Turner (1996) indicate a significant association between self-control and criminal behaviour only among men, not women. Henry et al. (1999) and Lagrange and Silverman (1999) find significant interactions with gender, suggesting that outcomes in criminal behaviour were differentially affected by other explanatory measures that varied by gender. Finally, other

studies (Shekarhar and Gibson 2011; Higgins and Tewksbury 2006; Blackwell and Piquero 2005; Burton et al. 1998; Tibbetts and Herz 1996) that modelled the impact of self-control separately by gender provide evidence that these models, and the importance of the measure of interest – self-control – differed by gender, as well as other measures. These studies further suggest that the hypothesis of gender invariance proposed by the General Theory of Crime may not be valid.

Ten other studies (de Kemp et al. 2009; McGloin and Shermer 2009; Ribeaud and Eisner 2006; Vazsonyi and Crosswhite 2004; Vazsonyi et al. 2004; Mason and Windle 2002; Vazsonyi et al. 2001; Lynskey et al. 2000; Avakame 1998; Keane et al. 1993) find at least weak evidence in support of the hypothesis of gender invariance regarding the impact of self-control. Each of these studies examines the predictive ability of self-control on criminal behaviour separately among males and females. Regardless of gender, an individual who reported having low self-control was more likely to behave criminally. Taken as a whole, the studies that examine the relationship between gender, self-control and criminal behaviour produced quite inconsistent evidence. It appears that the gender invariance hypothesis posited by the General Theory of Crime may not be supported, and that the traditional measurement of self-control may not be equally valid for male and female respondents.

Summary.

There is a large body of evidence suggesting an inverse relationship between self-control and criminal behaviour, albeit a weak relationship. Largely, the hypotheses of the General Theory of Crime were confirmed in this body of literature regardless of the measurement of the theoretical constructs and outcome of criminal behaviour. Furthermore, length of study did not appear to have a large impact on the strength of evidence in support of the theory (as argued by Gottfredson and Hirschi). These factors indicate that the theory is empirically valid in the majority of cases, and provide a succinct explanation of the development of criminal behaviour over the life-course. On the other hand, there is also some evidence suggesting otherwise. Generally, when competing theories are included alongside the construct of self-control, its impact diminishes greatly, implying that the General Theory of Crime may in fact not reflect the actual social processes involved with

criminal behaviour. Furthermore, varying effect sizes for self-control across samples and gender decrease the support for the empirical validity of the proposed theory.

Empirical Support of the Interactional Theory

Strength of support.

Ten studies are identified that empirically examine the Interactional Theory (see Appendix B). Of these studies, only three provide evidence with moderate support of the propositions of the theory: Thornberry et al. (2003), Jang (1999a), and Thornberry et al. (1991). The remainder of the studies provide weak evidence supporting the theory.[16] As proposed in the Interactional Theory, a number of these studies find that higher levels of attachment to parents and school were associated with fewer occurrences of criminal behaviour, whereas association with delinquent peers was related to an increased amount of criminal behaviour.

Only a handful of studies test and support the reciprocal nature of these relationships. These studies suggest that there is a reciprocal relationship between criminal behaviour and various types of social attachment. For example, decreases in attachment to parents are related to increases in criminal behaviour, and led to further decreases in attachment to parents. Although based on limited evidence, the Interactional Theory appears to be a valid theory of criminal behaviour; however, several other considerations are necessary to evaluate the empirical validity of theory.

Measurement of constructs.

The number of proposed constructs in the studies varied, but the measurement of concepts central to the Interactional Theory, such as attachment to parents and school, and association with delinquent peers, was similar across studies. For example, studies typically measured the construct of association with delinquent peers by asking respondents to indicate the deviant acts in which their closest friends were involved. Researchers tapped the same construct in the individual studies, even though the behaviours ranged in severity and number. In addition to the central constructs of the theory, the measurement of criminal behaviour was similar across studies. In most cases, the studies use a scale of self-reported delinquency and include criminal behaviours such

[16] see Mears and Field (2002), Matsueda and Anderson (1998), Thornberry et al. (1998), Jang and Smith (1997), Krohn et al. (1996), Thornberry et al. (1994), Lawrence (1991).

as illicit substance abuse, theft, and using a weapon to hurt someone. This suggests that the Interactional Theory is empirically valid across a wide range of behaviours. Overall, the difference between studies in their measurements of theory constructs and criminal behaviour was limited and unrelated to the strength of evidence reported by a study, further substantiating the empirical validity of the theory.

Research design.

The length of the study period had an effect on the strength of evidence produced in studies. The follow-up period of the studies varied from cross-sectional analyses to longitudinal analyses. Longitudinal studies were more likely to produce moderate evidence in support of the theory compared to cross-sectional studies. Among the longitudinal studies, periods of follow-up ranged from a year and a half to almost nine years. Longitudinal studies that followed respondents for a period of five years or longer (e.g., Thornberry et al. 2003; Jang 1999a; Matsueda and Anderson 1998; Thornberry et al. 1998) were more likely to produce moderate evidence in support of the theory compared with studies following respondents for fewer than five years (e.g., Jang and Smith 1997; Krohn et al. 1996; Thornberry et al. 1994; Thornberry et al. 1991). This positive relationship corresponds with the life-course aspect of the Interactional Theory, and lends further support to the empirical validity of this theory.

Only one of the studies tests alternative theory of criminal behaviour. Typological theories, such as the Dual Taxonomy, have called for the inclusion of age of onset and Thornberry (1998) included this construct while examining the Interactional Theory. Although this study did not find support for typological theories, the support for the Interactional Theory was weak. This single finding is not enough to assess the impact of other theories on the empirical validity of the Interactional Theory.

The studies empirically validating the Interactional Theory use two different longitudinal samples of youth: the National Youth Survey and the Rochester Youth Development Survey. The strength of evidence did not vary between the samples suggesting that the model is valid across groups, but this is limited as the theory was only validated using two samples of youth in the United States around the same period of time.

Gender differences.

Finally, four studies examine whether the theory is invariant by gender: Jang and Smith (1997), Krohn et al. (1996), Lawrence (1991), and Thornberry et al. (1991). Three of these studies provide evidence in support of gender invariance. Lawrence (1991:63-64) reports no differences by gender in the number of delinquent acts committed, or in average attachment to school. In studies conducted by Krohn et al. (1996) and Thornberry et al. (1991), the differences between males and females were quite small. Based on this evidence, these authors conclude that the model proposed by the Interactional Theory applied well to both males and females.

In contrast, Jang and Smith (1997) find that males are less likely to maintain affective ties with parents over time. The authors conclude that the "process of individuation or detachment" from family may be different for adolescent males and females (Jang and Smith 1997:323). This difference is associated with an increase in criminal behaviour, which suggests that the pathways to this behaviour proposed in the theory may differ by gender due to these differences in the process of individuation. Overall, the Interactional Theory appears to be equally valid among females and males. Yet, evidence suggests that the developmental pathways of criminal behaviour are different for males and females.

Summary.

Not all of the studies of Interactional Theory that were reviewed provide evidence of its empirical validity, and the majority of the evidence is weak at best. As suggested by the theory, decreased attachment to parents and school and increased association with delinquent peers are associated with increases in criminal behaviour. Furthermore, these relationships appear to be reciprocal in nature. Evidence in support of the theory does not vary significantly by sample, measurement of theory constructs or criminal behaviour, or with the inclusion of the alternative theory constructs; however, longer periods of follow-up generally provide stronger evidence in support of the theory. Although some evidence indicates that the developmental pathways of criminal behaviour may differ slightly by gender, the majority of the evidence provided by the empirical validation of this theory suggests that it is gender invariant. Generally, it appears that the proposed Interactional Theory is a valid reflection of the pathways to involvement in criminal behaviour.

Empirical Support of Dual Taxonomy

Strength of support.

Fifty-two studies are identified that test the tenets of the Dual Taxonomy proposed by Moffitt (1990) (see appendix C). Of these studies, 30 are classified as providing weak support of the theory.[17] Thirteen of the studies[18] provide evidence in moderate support of the theory. Only three of the studies produce evidence in strong support of the theory: Barnes, Beaver and Piquero (2011), Gardner (2006) and Moffitt et al. (1994). Finally, eight of the studies produced evidence that does not support the hypotheses of the Dual Taxonomy: Walters (2011), Johnson (2009), Sampson and Laub (2005), Sampson and Laub (2003), Chung et al. (2002), White et al. (2001), Kratzer and Hodgins (1999), Paternoster and Brame (1997).

In all, 37 of 52 studies provide evidence supporting the argument that there are different groups of offenders with different risk factors leading to membership in these groups. In general, the literature empirically validates the existence of three groups: life-course-persistent offenders, individuals who only offend during adolescence, and those who abstain from offending over the life-course. Further, as suggested by the Dual Taxonomy, evidence validates that these groups could be differentiated by examining neuropsychological deficits and the experience of the maturity gap. Neuropsychological deficits were generally associated with life-course-persistent offending. In addition, evidence validates the hypothesis that neuropsychological differences and family adversity interact to predict involvement in life-course-persistent offending. Those individuals who experience both neuropsychological deficits and family adversity are more likely to be life-course-persistent offenders compared to other individuals. Although this hypothesis is central to the theory, only six of the 50 studies (Gibson et al. 2001;

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[17] see Barnes and Beaver (2010) Chen (2010); Chen and Adams (2010); Savolainen et al. (2010); Stattin, Kerr and Bergman (2010); Roisman et al. (2010); Parker and Morton (2009); Yessine (2009); Saunders (2007); Carroll et al. (2006); Cauffman, Steinberg and Piquero (2005); Piquero, Gover et al. (2005); Raine et al. (2005); Piquero, Brame and Lynam (2004); Piquero and White (2003); Weisner and Capaldi (2003); Fergusson and Horwood (2002); Mazerolle and Maahs (2002); Moffitt et al. (2002); Ge et al. (2001); Piquero and Brezina (2001); Aguilar et al. (2000); Donellan et al. (2000); Kjelsberg (1999); Roeder et al. (1999); Zebrowitz et al. (1998); Stattin, Romelsjo, Steinbacka (1997); Dean et al. (1996); Nagin et al. (1995); White et al. (1990)

[18] see Moffitt and Caspi (2005); Woodward et al. (2002); Gibson et al. (2001); Moffitt et al. (2001a; Moffitt et al. (2001b); Moffitt et al. (2001c); Piquero, Fergusson and Horwood (2001); Fergusson et al. (2000); Bartusch et al. (1997); Moffitt et al. (1996); White et al. (1994); Caspi et al. (1993); Moffitt et al. (1990).

Piquero and Brezina, 2001; Piquero et al. 2001; Stattin 1997; Moffitt et al. 1994; Moffitt 1990) empirically validate this aspect of the theory. Although evidence was weak, the propositions of the Dual Taxonomy appear empirically valid.

Additionally, some studies find that expressions of autonomy or experiencing the maturity gap relates to adolescent-limited offending. For example, Caspi et al. (1993) and Piquero and Brezina (2001) find that individuals experiencing early maturity were more likely to behave criminally compared to those not maturing early. Both of these studies also provide evidence contrary to the predictions of the Dual Taxonomy. For example, Caspi et al. (1993:26) show that this relationship was inconsistent across groups when the authors considered type of school and delinquent peers. Furthermore, Piquero and Brezina (2001:364) find that desire for autonomy could not differentiate between types of offences; they also find that relationship with peers, especially the autonomy aspects of these relationships, was more important in predicting adolescent-limited offending than a desire for autonomy. This suggests a possible misspecification of the concepts forwarded in the Dual Taxonomy for the etiology of adolescent offending, and the empirical validity of the theory tends to decline in this light.

Three studies (Chen and Adams 2010; Johnson 2009; Piquero et al. 2005) examine the individual characteristics proposed by the theory to predict abstention from criminal behaviour. As noted previously, the theory predicts that abstainers will be a socially isolated group of individuals excluded by delinquent peers because of excessive conformity and depression. Both Chen and Adams (2010:460) and Piquero et al. (2005:45) produce evidence in mixed support of this proposition. As proposed by the theory, abstainers were highly attached to teachers, and were less likely to have relationships with delinquent peers, suggesting that the "good" student may in fact be rejected by their peers (Chen and Adams 2010:460; Piquero et al. 2005:45); however, contrary to predictions, abstainers are less likely to report depression and are not completely excluded by their peers (evidenced by their dating behaviours) (Piquero et al. 2005: 45). Yet, their peers tend to be more prosocial than the peers of their offending counterparts. Johnson (2009:174) provides evidence of the similarities between abstainers and less chronic offenders in many cases. These studies suggest that the Dual Taxonomy propositions about abstainers may not reflect the actual unfolding of this behaviour.

Measurement of constructs.

Studies operationalize the construct central to the Dual Taxonomy, neuropsychological deficits, in various manners. Studies include measures such as the Stroop test, verbal ability test, IQ tests, and impulsivity tests to assess neuropsychological deficits. Generally, the weakest proxies used to assess these deficits are an IQ test or a rating of impulsivity. Yet, precision in the measurement of the construct is not associated with significant variations in the strength of evidence produced in support of the theory.[19] Overall, this lends support for the validity and reliability of this indicator.

The operationalization of criminal behaviour varies across studies; however, this does not appear to have an impact on the strength of evidence that each study provides. Typically, studies use three different types of measures for tapping criminal behaviour: self-reported, officially recorded, and trajectories of criminal behaviour (i.e., offending over the life-course and offending only in childhood, adolescence or adulthood). Self-reported and/or officially reported criminal behaviour is the basis for the development of criminal trajectories in all cases. Although the measurement of the outcome does not appear to have an impact on the strength of evidence, the studies that examined criminal behaviour (whether unofficially or officially reported) tend to produce moderate evidence in support of the Dual Taxonomy; whereas studies that use criminal trajectories as an outcome tend to produce weak evidence in support of the theory. This relates to the fact that most of the studies produce evidence that more trajectories exist than hypothesized, thus decreasing the strength of evidence in support of the theory. These overall trends suggest that the Dual Taxonomy applies well to a range of criminal behaviours, however, there is some evidence that only two groups of offenders may not actually capture the heterogeneity of offenders.

Research design.

Both longitudinal design and length of follow-up have an impact on the strength of evidence found in support of the Dual Taxonomy. There is a tendency for studies that use cross-sectional data to provide weak support for the theory and studies with longitudinal data of over 15 years tend to produce more moderate findings. This evidence suggests

[19] Due to the small number of studies dedicated to studying adolescent-only offending and abstention from criminal behaviour, a comparison of measure operationalization was not possible.

that one must test a life-course, such as the Dual Taxonomy, over time for it to be empirically validated. The strongest supporting evidence is produced by the studies with lengthy follow-up periods.

Only five of the studies examine the constructs of competing theories of criminal behaviour: Parker and Morton (2009), Cauffman et al. (2005), Chung et al. (2002), Paternoster and Brame (1997) and Nagin et al. (1995). Typically, when the constructs of another theory are included, the study shows little support for the Dual Taxonomy. This may reflect the use of weak measures of neuropsychological deficits, however, some of the studies providing no support for the Dual Taxonomy did use strong measures of these concepts. Regardless of the issue with measurement of the constructs, this finding calls into question the empirical validity of the Dual Taxonomy in the face of other theories.

Studies have employed samples of youth and young adults from three regions to test the propositions of the Dual Taxonomy: international, American and New Zealand. The American samples produced findings of no support compared to other studies. Both the international and American studies were more likely to produce weak evidence in comparison to the Dunedin study. The studies using the Dunedin sample produced moderate and strong findings, however, this may reflect the better operationalization of concepts in the study, as this study was used originally to develop the theory and may be best suited to the test the theory. These variations in the strength of evidence in support of the Dual Taxonomy suggest the theory may not be valid cross-culturally.

Gender differences.

In total, 15 studies examine gender differences in the development of criminal behaviour. The Dual Taxonomy hypothesizes that females are more likely to be classified as adolescent-limited offenders than life-course-persistent offenders, whereas males dominate the life-course-persistent offending group (Moffitt 2006:589). These differences reflect the fact that females are less likely than males to experience family adversity as well as neuropsychological deficits (Moffitt 2006:588). Thus, females are underrepresented compared to males; however, females who experience these factors would be predicted to fall in the life-course-persistent offending group as well.

Twelve studies[20] provide some support of the hypotheses of gender invariance of the Dual Taxonomy. Generally, these studies provide evidence that there were few to no differences by gender when empirically validating the hypotheses proposed by the Dual Taxonomy. Moffitt et al. (2001b) and Piquero et al. (2005) report that the majority of risk factors were similar for males and females in terms of predicting criminal outcomes or abstention from criminal behaviour (as examined by Piquero et al. 2005); however, some differences were noted. For example, association with delinquent peers was negatively related to abstention among men only, whereas dating behaviours and autonomy had a negative impact on abstention among women (Piquero et al. 2005:47). Moreover, attachment to teachers positively influenced only males in regards to abstention. Barnes and Beaver (2010:1182) note that the maturity gap was predictive of minor delinquency and drug use for men whereas it was only predictive of drug use for women.

The remainder of the studies confirm that the risk factors used to predict group membership in the adolescent-limited and life-course-persistent offending groups were the same for males and females. First, as hypothesized by the Dual Taxonomy, Fergusson et al. (2000:543) note that compared with males, fewer females were life-course-persistent offenders. Furthermore, as predicted by the theory, Moffitt et al. (2001a:158) confirm that the same risk factors predicted membership in the group of life-course-persistent offenders for both males and females, and that fewer females reported these risk factors. Moffitt and Caspi (2005) reconfirm these findings. Another three of the studies (Fergusson and Horwood 2002; Moffitt et al. 2001c; White et al. 1990) assess differences by gender through interactions and find no differences in the risk factors used to predict membership in the offending group. Barnes et al. (2011:704-705), Chen and Adams (2010:456) and Roisman et al. (2010:309) noted few significant differences by gender in the findings relating to the Dual Taxonomy. The majority of the evidence suggests that the hypotheses of the Dual Taxonomy regarding gender invariance are valid.

Only two of the studies provide evidence against the gender hypotheses of the Dual Taxonomy: Kjelsberg (1999) and Kratzer and Hodgins (1999). These studies

[20] see Barnes and Beaver (2010); Yessine (2009), Moffitt and Caspi (2005), Piquero et al. (2005), Fergusson and Horwood (2002), Moffitt et al. (2001a), Moffitt et al. (2001b), Moffitt et al. (2001c), Fergusson et al. (2000), and White et al. (1990)

provide evidence that the proportion of males and females in the different offending groups may not be similar to the proportions hypothesized by the theory. Furthermore, evidence from Kjelsberg (1999:281) suggests that some factors relating to life-course-persistent offending may differ by gender. For example, only childhood risk factors were important for the initiation of life-course-persistent offending for males, whereas proximal factors were important for females' initiation of life-course-persistent offending. These two studies call into question the hypothesis that risk factors are invariant by gender.

Summary.

Overall, the empirical validity of the Dual Taxonomy appears weak at best. Not only do a majority of studies provide weak evidence in support of the theory, but there is substantial evidence suggesting that only two groups of offenders may not reflect the heterogeneity in the offending population. Yet, much of the evidence does suggest that neuropsychological deficits, especially when coupled with family adversity, predict life-course-persistent offending. Furthermore, evidence supports the hypothesis that a desire for autonomy (or experiencing the maturity gap) is related to adolescent-limited offending. There is also some evidence that abstainers may be a group of conforming individuals rejected by deviant groups during adolescence. Generally, measurement of criminal behaviour and the theory constructs did not have an impact on the strength of evidence produced in favour of the theory; however, longitudinal design and longer periods of follow-up were associated with producing stronger evidence in support of the Dual Taxonomy. Yet the theory did not appear to maintain its explanatory power when other theories of criminal behaviour were considered. Furthermore, findings tend to vary across samples suggesting the theory may not be as generalizable as proposed; however, it does appear that the theory is invariant by gender.

Empirical Support of the Age-graded Theory of Informal Social Control

Strength of support.

Forty-two articles examine the empirical validity of the Age-graded Theory of Informal Social Control (see Appendix D). The majority of the studies[21] provide weak support of

[21] see Petras, Nieuwbeerta and Piquero (2010); Bersani, Laub and Nieuwbeerta; (2009), King, Massoglia and MacMillian (2007); Blokland, Nagin and Nieuwbeerta (2005); Blokland and Nieuwbeerta (2005); Liu

the theory. Eight of the studies[22] provide moderate support. Four studies[23] provide strong support of the theory. Finally, ten studies provide no evidence supporting the tenets of the theory.[24] Although there is some evidence against the Age-graded Theory of Informal Social Control, the majority of studies suggest that increased levels of informal social control over the life-course, especially in adulthood, are associated with decreases in criminal behaviour.

Measurement of constructs.

Although the majority of the studies did not empirically support the full model proposed in the Age-graded Theory of Informal Social Control, they typically operationalize the theory's constructs as proposed by Sampson and Laub; albeit, some measures are less precise than others. Two central constructs were included in the majority of studies: quality of marital relations and quality of employment. At a minimum, studies examined whether an individual was married or employed. This operationalization was the weakest form of measurement of these concepts. The more precise measurements of these concepts attempt to tap the quality of marital relationships and employment. For example, respondents assessed the nature of their marital relationship and the strength of their attachment to their jobs. Generally, studies using weak measures of these concepts[25] provide less evidence supporting the propositions of the theory. Not surprisingly, the remainder of the studies tend to measure the concept with more precision and produce slightly stronger evidence in support of the Age-graded Theory of Informal Social Control. Although measurement of these concepts has an impact on study conclusions, the propositions of the theory appear to be empirically valid in the majority of cases.

(2005); Massoglia and Uggen (2007); Maume, Ousey and Beaver (2005); Yang (2004); Yeager (2004); Giordano, Cernovich and Rudolph (2002); Mason and Windle (2002); Piquero, MacDonald and Parker (2002); Wright, Cullen and Williams (2002); Kruttschnitt, Uggen and Shelton (2000); Arum and Beattie (1999); Hughes (1998); Wade and Brannigan (1998); Horney, Osgood and Marshall (1995) and Laub and Sampson (1988).

[22] see Savolianen (2010); Doherty (2006); Sampson, Laub and Wimer (2006); Wright and Cullen (2004); Meeus et al. (2004); Wright et al. (2001); Laub, Nagin and Sampson (1998); and Sampson and Laub (1990)

[23] see Laub and Sampson (2003); Sampson and Laub (1994); Laub and Sampson (1993); and Sampson and Laub (1993).

[24] see Ford and Schroeder (2011); Hardwick and Brannigan (2008); Schroeder, Giordano and Cernovich (2007); Deli and MacKenzie (2003); Simons et al. (2002); Uggen and Janikula (1999); Hartnagel (1998); Uggen and Kruttschnitt (1998); Warr (1998); and Ploeger (1997).

[25] see Bersani et al.(2009); King et al. (2007); Schroeder et al. (2007); Liu (2005); Blokland et al. (2005); Blokland and Nieuwbeerta (2005); Yeager (2004); Deli and Mackenzie (2003); Piquero et al. (2002); Wright et al. (2001); Kruttschnitt et al. (2000); Arum and Beattie (1999); Uggen and Janikula (1999); Uggen and Kruttschnitt (1998); Wade and Brannigan (1998); Horney et al. (1995).

Generally, studies incorporate three measures of criminal behaviour to assess the theory: official records, self-reported information and a combination of both official and self-reported information. Many studies[26] use official records such as arrest or conviction. Several studies[27] combine information from both officially and self-reported behaviour. Many of the studies examined self-reported criminal behaviour, generally measured by the number of times respondents report committing a variety of violent and property crimes. Studies using official records and those using a combination of official and self-reported criminal behaviour are more likely to produce strong evidence in support of the Age-graded Theory of Informal Social Control; whereas, studies relying solely on self-reported behaviour tend not to produce evidence in support of the theory. This variation in strength of evidence suggests that the theory may not be equally valid for different types of criminal behaviour. The theory may account better for serious criminal behaviour that is more likely to attract the attention of the criminal justice system and, therefore, officially recorded in the form of records of arrest or conviction.

Research design.

All but two of the studies, Wade and Brannigan (1998) and Hughes (1998), are longitudinal. The studies vary greatly in terms of length of follow-up, which ranged from six months to 56 years. Almost half of the studies followed participants for fewer than seven years (ranging from six months to six years). The remainder of the studies followed participants for seven to 56 years. Generally, as length of follow-up increased, so did the strength of evidence supporting the Age-graded Theory of Informal Social Control, which suggests that the validity of the theory increases over time.

In all, eight studies examine the validity of the Age-graded Theory of Informal Social Control in the face of other theories of criminal behaviour.[28] The General Theory of Crime was the theory most often compared with the Age-graded Theory of Informal Social Control, but a few of the studies also considered the constructs of the Dual

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[26] e.g., Bersani et al. (2009); Savolainen (2009); Doherty (2006); Sampson et al. (2006); Liu (2005); Yeager (2004); Laub and Sampson (2003); Simons et al. (2002); Piquero et al.(2002); Kruttschnitt et al. (2000); Arum and Beattie (1999); Laub et al. (1998); Laub et al. (1993); Laub and Sampson (1988).

[27] e.g., Hardwick and Brannigan (2008); Massoglia and Uggen (2007); Blokland and Nieuwbeerta (2005); Giordano et al. (2002); Wright et al. (2001); Sampson and Laub (1994); Sampson and Laub (1993); Sampson and Laub (1990).

[28] see Hardwick and Brannigan (2008); Schroeder et al. (2007); Doherty (2006); Yang (2004); Mason and Windle (2002); Wright et al. (2002); Wright et al. (2001); Laub et al. (1998).

Taxonomy and Differential Association Theory. Generally, when the Age-graded Theory of Informal Social Control is compared with other theories, the strength of the evidence in support of this theory decreases slightly, but the empirical validity of the model remains intact.

Studies testing the Age-graded Theory of Informal Social Control used three types of samples: the Unravelling Juvenile Delinquency data (1992), general population data, and samples of offenders (see Appendix D). The Unravelling Juvenile Delinquency data on male offenders and matched non-offenders, collected by the Gluecks and Sampson and Laub, produce more evidence in strong or moderate support of the Age-graded Theory of Informal Social Control than studies examining other samples. Studies of the general population, which included both youth and adults, are much more likely than other studies to find no supporting evidence. Furthermore, these studies produce no evidence in strong support of the theory. Finally, approximately one-third of the studies rely on samples of offenders and these studies typically produce weak supporting evidence. Interestingly, these studies do not produce evidence similar to studies using the Unravelling Juvenile Delinquency data (which rely heavily on the offender information). This variation suggests that the theory may not be equally valid across populations. Furthermore, the different periods between the Unravelling Juvenile Delinquency data and the other studies of offenders might suggest that the Age-graded Theory of Informal Social Control is more applicable to the early 20th century rather than the late 20th century. Taken as a whole, this evidence calls into question the propositions of the theory.

Gender differences.

Only eight studies – Petras et al. (2009); Bersani et al. (2009); King et al. (2007); Deli and Mackenzie (2003); Giordano et al. (2002); Mason and Windle (2002); Simons et al. (2002); Uggen and Kruttschnitt (1998) - examine the implicit hypothesis of gender invariance in relation to the Age-graded Theory of Informal Social Control. Five of the studies (Petras et al. 2010; King et al. 2007; Mason and Windle 2002; Simons et al. 2002; Deli and Mackenzie 2003) provide evidence against this hypothesis. Mason and Windle (2002) and Deli and Mackenzie (2003) observe that the theory explained reductions in the criminal behaviour of men. Both King et al. (2007:56) and Mason and Windle (2002:479) note that the theory does not predict the criminal behaviour of women well. Additionally,

Deli and Mackenzie (2003:294) note that the proposed constructs actually predict an increase in the criminal behaviour of women. Unlike the previous studies, Simons et al. (2002:402) find that the tenets of the proposed theory are not supported among the samples of males; however, social relationships tend to exert more influence on the behaviour of women, as predicted by the theory. Each of these studies suggests that the theory may not explain the criminal behaviour of men and women equally well.

Four of the studies – Petras et al. 2010; Bersani et al. 2009; Giordano et al. 2002; Uggen and Kruttschnitt 1998 - find limited differences between men and women in the application of the Age-graded Theory of Informal Social Control. In all of these studies, no large differences are found between men and women; however, differences in the relative importance of factors predicting criminal behaviour among men and women are noted. For example, Bersani et al. (2009:19) note that effect of marriage was larger for men compared to women. Further, although there were great similarities between men and women, women are more likely than men to suggest that religion and their children act as turning points for their behaviour compared to men (Giordano et al. 2002:1052). This model may not be equally valid for men and women; however, the major arguments of the Age-graded Theory of Informal Social Control remain intact – the mechanism of informal social control remains the same for both sexes although the sources of informal social control may vary by gender.

Summary.

Overall, a majority of studies suggest that increased levels of informal social control over the life-course, especially in adulthood, are associated with a decrease in criminal behaviour. In support of theory, the majority of studies, regardless of the measurement of theoretical concepts and the inclusion of competing theories of the development of criminal behaviour, empirically validate the theory. In fact, the strength of evidence increased with the length of follow-up. Yet, there is some evidence questioning the empirical validity of the theory. The theory may not apply equally to a range of criminal behaviours. Variations in the strength of evidence by sample and gender further support this. The mechanism of informal social control seemed to work similarly for men and women, although the sources of control appeared to vary in relative importance in predicting criminal behaviour.

Summary and Research Questions

In review, the examination of the unfolding of criminal behaviour over the life-course is a pervasive topic in criminology. Over the decades, longitudinal research has illuminated several persistent findings regarding this behaviour. Individual risk factors, including low intelligence, low achievement in school, hyperactivity and impulsivity, affinity for risk-taking, and having an anti-social personality have consistently been strong predictors of criminal behaviour. Several family-related predictors have been consistently linked with criminal behaviour: poor parental supervision, harsh and/or inconsistent discipline, low attachment to parents and/or childhood neglect, being from a broken home, and having criminal family members. Furthermore, many studies suggest that lower social class, the presence of delinquent peers, rejection by peers or low popularity, high rate of delinquency in school of attendance, and high neighbourhood crime are associated with increased criminal behaviour. There is a strong link between offending as a juvenile and the continuation of offending in adulthood; however, more recent observations suggest that this continuity is far more complex than previously indicated. Not only are offenders heterogeneous in their criminal behaviour, but also in their desistance from criminal behaviour. Desistance typically occurs in early adulthood and several factors predict desistance from criminal behaviour, such as being in a quality marital relationship, having job satisfaction, or residential upper mobility.

Additionally, decades of studies illuminate differences in the offending patterns of men and women. First, men are more likely than women to persistently commit crimes at all stages of the life-course. Second, the criminal behaviour of men in comparison to women is more likely to be violent. Third, a growing body of literature[29] suggests that the psychosocial correlates used to predict criminal behaviour among men are relatively less effective in accounting for the criminal behaviour of women, although the psychosocial correlates of criminal behaviour are similar for men and women[30]. Yet, few gender-specific theories of criminal behaviour over the life-course have been proposed (Tracy,

[29] for example, see Juon, Doherty and Ensminger (2006:208); Piquero et al. (2005a:46); Van Lier et al. (2005:851-852); Farrington and Painter (2004:11-12); Junger-Tas, Ribeaud, and Cruyff (2004:367-377); Hartjen and Priyadsini (2003:400); Fleming et al. (2002:436); Laundra, Kiger and Bahr (2002:401); Moffitt and Caspi (2001:365); Piquero and Chung (2001:197); Mears, Ploeger and Warr (1998:263).

[30] for example, see Hartjen and Priyadsini (2003); Fergusson and Horwood (2002); Leschied et al. (2001); Moffitt and Caspi (2001); Piquero (2000); Liu and Kaplan (1999); Smith and Paternoster (1987); Canter (1982a); Figueira-McDonough and Selo (1980); Simons, Miller and Aigner (1980); Smith (1979).

Kempf-Leonard and Abramoske-James 2009:211; Lanct□t and Le Blanc 2002:151; Katz 2000:655; Kruttschnitt 1996:153-154; Chesney-Lind 1989:25). To date, theories that examine this behaviour over the life-course remain gender-neutral.

This literature review focuses on the four most dominant theories of criminal behaviour over the life-course: the General Theory of Crime, Interactional Theory, Dual Taxonomy of Offending, and Age-Graded Theory of Informal Social Control. Each of these theories proposes different causes of criminal offending over the life-course. The General Theory of Crime proposes that low self-control in conjunction with criminal opportunities incites criminal behaviour. Whereas dynamic theories, such as the Interactional Theory, purport the changing nature of social relations and the opportunities that arise from these relations explain criminal behaviour over the life–course. The Interactional Theory suggests that decreased attachment to parents and school and increased association with delinquent peers account for criminal behaviour. Furthermore, these relationships are reciprocal in nature.

Both the Age-graded Theory of Informal Social Control and the Dual Taxonomy combine the static and dynamic explanations in accounting for criminal behaviour over the life-course. For example, the Dual Taxonomy proposes that neuropsychological deficits, a static trait, predict life-course-persistent offending when coupled with family adversity. Yet, when explaining the criminal behaviour of adolescent-limited offending a dynamic argument is used. The Dual Taxonomy proposes that the initiation and termination of adolescent-limited offending is related to the social experience of the maturity gap. This transitory criminal behaviour is related to a desire for autonomy. Finally, the Age-graded Theory of Informal Social Control contends that static factors, such as child temperament, have an indirect effect on criminal behaviour over the life-course; however, the presence of formal and informal social controls can influence these propensities. This theory proposes that, while accounting for individual criminal propensities, increased levels of informal social control are related to decreases in criminal behaviour over the life-course, especially in adulthood.

This review examines the body of literature that empirically validated these theories, and using a simple categorization technique assessed the strength of evidence produced in support of the various theories. Criteria used to classify the strength of

supporting evidence included model specification of the proposed theory, model fit and effect size, findings that reflect the proposed hypotheses regarding structural relationship, and maintenance of hypothesized findings when other theories are considered. Generally, using this categorization technique, the majority of evidence weakly supported the proposed theories. The central tenets of each of the theories were empirically validated.

A higher-level examination was also conducted to ensure that the validity of the theories was not related to research design. Specifically, the strength of support categories were examined across aspects of research design, such as measurement of concepts and outcome, length of follow-up period, consideration of other theories, and type of sample. Great variations in strength of evidence by these design issues can suggest that propositions of a theory may not hold in all cases and may not reflect a general process of criminal behaviour over the life-course. Strength of evidence in support of the proposed theories did vary by research design, calling into question the empirical validity of the proposed theories. In examining the General Theory of Crime and the Dual Taxonomy, it becomes evident that in the face of competing theories, the relative importance of the central tenets of these theories is reduced greatly. Furthermore, varying effect sizes for theory constructs across samples generally reduce the level of support for these two theories. Generally, the strength of evidence in support of the Age-graded Theory of Informal Social Control varied little by research design, but there was some evidence that sample and severity of offending may have an impact on the outcomes. Generally, the strength of evidence did not vary according to the design of the research for the Interactional Theory.

As noted in the introduction, few attempts have been made to examine how mainstream theories of criminal behaviour over the life-course apply to women, and if gender-specific theories of criminal behaviour are necessary to understand the complexity of this behaviour. Accordingly, each body of literature for the proposed theories was examined for gender differences in findings. Only the General Theory of Crime and the Dual Taxonomy explicitly address the effect of gender on criminal behaviour. Both indicate that outcomes should be invariant by gender. The remainder of the theories do not explicitly address gender issues and because of this they are considered gender-neutral. In total, only 49 of the 178 studies included in this literature review examined the

impact of gender on the proposed theories. In terms of the hypothesis of gender invariance, there is considerable evidence that gender has an impact on the outcomes of studies of the General Theory of Crime. Although gender has an impact on the relative importance of theory constructs of the Interactional Theory and the Age-graded Theory of Informal Social Control, it appears that the overarching mechanisms proposed in these theories accounts equally well for the criminal behaviour of both men and women. Finally, the Dual Taxonomy provides evidence supporting the gender invariance hypothesis.

Due to differences in samples and methodology across studies, it is difficult to assess whether gender variations is an artifact of the research design. Therefore, the present study aims to assess all the theories using a single sample and statistical technique.

Research Question 1: Do the proposed theories account equally well for the criminal behaviour of both men and women over the life-course?
Hypothesis 1: Based on the literature, it is hypothesized that the Dual Taxonomy applies to the criminal behaviour of men and women equally. It is also expected that overall the Interactional Theory and the Age-graded Theory of Informal Social Control account similarly for the criminal behaviour of men and women; however, it is also expected that the relative importance of proposed constructs will vary by gender. For example, family will be a more important source of informal social control for women and work will be more important for men. Finally, it is expected that gender will affect the outcomes of the General Theory of Crime. Based on the evidence in previous studies, it is expected that effect of self-control will explain more of the criminal behaviour of men than women.

A growing body of literature argues that women's offending is qualitatively different from that of men's (e.g., Brown 2006, Bennett, Farrington and Huesmann 2005; Leschied et al., 2001; Holsinger 2000). Brown (2006:138-139) contends that women's offending is related to violence, trauma, and addiction and, because of this, traditional theories of criminal behaviour cannot be simply applied to women. In addition to these arguments, there is empirical evidence that supports that different factors are better

predictors criminal behaviour over the life-course of men and women. For example, Heimer (1996:56-57) and Heimer and Decoster (1999:302) find that gender identity influences the criminal behaviour of males and females and this accounts for much of the gender gap. Rosenbaum (1987:117) finds that the Bond Theory accounted better for the criminal behaviour of women rather than of men. Landsheer and van Dijkum (2005:729) report an inability to predict the criminal behaviour of adolescent females from previous criminal behaviour; however, this was not the case for men. Due to these arguments and findings, some researchers (e.g., Higgins and Tewksbury 2006; Landsheer and van Dijkum 2005) contend that it is essential to test traditional theories of crime separately by gender; however, other theorists (Belknap 2007; Lanctôt and Le Blanc 2002; Katz 2000) go beyond this and suggest that gender-specific theories of criminal behaviour are necessary. In fact, a number of theorists (e.g., Belknap 2007; Lanctôt and Le Blanc 2002; Katz 2000) argue that gender-specific models for women must consider violence (experienced in both childhood and/or adulthood), and type of criminal offence being predicted. In light of the fact that few studies have examined a gender-specific theory of criminal behaviour over the life-course, and that no identified research has compared the empirical validity of mainstream theories with a gender-specific theory, it would be beneficial to examine how a gender-specific model, including factors that have been proposed as being specifically important to women, compares to the mainstream theories of criminal behaviour. Several authors have argued that a range of factors are necessary to properly account for the criminal behaviours of women. Included among these factors are the following: experiences of sexual and physical abuse (Giordano et al. 2002:995; Katz 2000:653; Chesney-Lind 1989:22), agreement with traditional gender roles, perceived disapproval by parents and peers of criminal behaviour, attitudes favouring criminal behaviour (Heimer 1996:52), and the presence of children (Giordano et al. 2002:997).

Research Question 2: Is the criminal behaviour of women over the life-course accounted for better by the inclusion of "women-specific" risk factors than by gender-neutral mainstream theories? Are gender-specific models (i.e., separate models for men and women) needed to best explain the criminal behaviour of women and men?

Hypothesis 2: It is expected that a model that includes risk factors specific to women will better account for the criminal behaviour of women than mainstream theories and that gender-specific modelling will not be necessary after the inclusion of these factors.

Moreover, the inclusion of variables that have been argued to account for the criminal behaviour of women may produce a more integrative theory that might better explain the criminal behaviour of both women and men.

Research Question 3: Is the criminal behaviour of men and women over the life-course accounted for better by an integrative theory (including women-specific factors and variables of the mainstream theories) than the mainstream theory alone?
Hypothesis 3: It is expected that integrative models will account for the criminal behaviour of men and women in a similar manner and better than mainstream theories.

In addition to the issues regarding gender, research design plays a rather large role in the ability to assess the validity of each of the developmental theories of criminal behaviour examined here. All but one of the theories necessarily require a longitudinal design to assess their theorized effects. In fact, the majority of the empirical evaluations of the Interactional Theory, the Dual Taxonomy, and the Age-graded Theory of Informal Social Control are longitudinal in nature: 80%, 91%, and 95% respectively; whereas, only 23% of the empirical examinations of the General Theory of crime are longitudinal designs. There is substantial variation among the longitudinal designs used in the various studies. Many of the designs only make use of information at two points in time and when more time points are used the statistical techniques for estimating the theoretical effects vary widely. The various techniques include latent growth curve modelling, semi-parametric group-based modelling, hierarchical linear modeling and panel regression. A handful of these studies have considered both the between- and within-individual effects (for example see Chen 2010; Johnson 2009; Petras 2010; Saunders 2007; Blokland and Nieubeerta 2002; Piquero 2002; Jang 1999; Horney et al. 1995), and only Barnes et al. (2011) has solely examined the impact of within-individual effects of these theories on the development of criminal behaviour. As argued in many of the theoretical designs both

between and within-person effects are important in explaining criminal behaviour over the life-course. For example, between-person effects (i.e., population heterogeneity) are the focus of the General Theory of Crime and within-individual effects (i.e., state dependence) are a focal point of the Interactional Theory. The Age-graded Theory of Informal Social Control and the Dual Taxonomy theorize about the impact of both between and within-person effects. Thus, this study captures the role of both the between- and within-person effects while considering gender.

Research Question 4: Beyond the interest in examining both between- and within-individual effects, is it necessary to use random-effects modelling to understand the criminal behaviour of men and women over time?
Hypothesis 4: It is expected that the use of random-effects modelling will be preferred over fixed-effects modelling because some of the time-invariant characteristics being examined in the models have been previously shown to influence criminal behaviour (i.e., gender, ethnicity, social class).

The use of random-effects modelling allows for an assessment of both population heterogeneity and state dependence arguments through the simultaneous examination of the unobserved heterogeneity and lag effects[31]. No research was identified that examined the impact of lag variables of the developmental theories examined in the current study. Both impact and the duration of the lagged effects are examined in the current study.

Research Question 5: Do the lag effects of significant independent variables and the dependent variable aid in the explanation of the criminal behaviour of men and women over the life-course?
Hypothesis 5: Lag effects will significantly account for the criminal behaviour of men and women and their explanatory power will significantly reduce the random intercept (i.e., unobserved heterogeneity).

[31] The inclusion of a lagged effect of the dependent variable also provides a test of spuriousness and controls for reverse causality.

CHAPTER 2: METHODS

In this section, five methodological considerations are addressed: the sampling design and data collection; missing and censored data; techniques and practical issues encountered when using multilevel models for panel data; measures used in each theory; and the specific analyses used in this study.

Sample

The sample used for this study is from the longitudinal National Youth Survey (NYS), which was designed to be representative of adolescents in the contiguous United States (Bureau of Justice Statistics 1989:674). The original sample consisted of 1,725 adolescents born between 1959 and 1965 ranging from ages 11 to 17 in 1976 when data collection began. Approximately 250 youth represent each of the seven age groups of participants in the sample (Menard and Elliott 1990). The first wave of participants consisted of 918 males and 807 females. Due to attrition, the sample size for the seventh wave of data decreased to 1,385 with 702 males and 683 females participating.

Sampling Design and Representation of the Population

Using a self-weighting probability sample of households, the survey targeted youth in the continental United States who were 11 to 17 years old as of December 31, 1976 and mentally and physically capable of being interviewed. A multistage, cluster sampling design was used with 76 identified primary sampling units. These units had probabilities of selection that were proportional to size, and resulted in 67,266 listed and 8,000 selected households. 2,360 youths were eligible and 73% of those eligible actually participated (for further information see Bureau of Justice Statistics 1989:754).

The use of probability sampling resulted in a representative sample of the population of youth ages 11 to 17 in the continental United States. Participants in the survey appeared to be representative of their non-participating counterparts in terms of age, sex and racial category when compared to estimates published by the U.S. Census Bureau in 1976 (Bureau of Justice Statistics 1989).

Data Collection

The data used in this study were collected in the first seven waves of the NYS. The data were obtained through the *Interuniversity Consortium for Political and Social Research*

(*ICPSR*) database. The first through fifth waves of data collection occurred between January and March in 1977, 1978, 1979, 1980 and 1981 and collected information on events and behaviours in the previous years (Elliott and Ageton 1980:98). Using somewhat different interview instruments (Menard and Elliott 1990), the sixth wave occurred in 1984, and gathered information on behaviours and events in 1981, 1982 and 1983. The seventh wave used the same style of instrument to collect data in 1987, and gathered information pertaining to 1984, 1985 and 1986. By the end of the seventh wave, participants ranged in age from 21 to 27. In addition to the data collected from the youth participants, the first wave included an interview with parents.

In all the waves, participants were interviewed face-to-face in their own homes as long as privacy could be ensured; otherwise, interviews occurred elsewhere in a private setting (Bureau of Justice Statistics 1989). Respondents were guaranteed that all information would be confidential and would not be released without their written consent. All data are protected with a privacy and confidentiality certification by the U.S. Departments of Justice and Health and Human Services (Huizinga and Elliott 1987:207).

Interview Instrument

There are two main interview instruments: the parent interview and the youth interview. Parents were interviewed only once, during the first wave. Across the waves, some of the items in the youth instrument did change; however, the general areas of interest remained the same. The instruments used in the sixth and the seventh waves are at least two times longer in terms of number of items since they covered three years and more topics than previous waves.

Parent interview instrument.

In total, there are approximately 160 items that cover a range of topics, such as respondents' characteristics, disruptive events in the home, housing and neighbourhood, normlessness, parental aspirations for youth, labelling, integration of family and peers contexts, attitude towards deviance in adults, attitude towards deviance in youth, counter-labelling, parental approval and parental discipline.[32]

[32] This instrument is available through the ICPSR database as part of the study materials for the first wave of data collection.

Youth interview instrument.

There is some variation in the number of items over the waves. The first five waves of the NYS contain approximately 700 items, whereas the last two waves contained approximately 1,500 items. The last two waves covered longer periods of time than the previous waves; major topics of interest were covered across all waves. Most notably, each survey had a section dealing with the following topics: respondent characteristics; life events, including disruptive events for parents; neighbourhood problems; social integration, such as community activities and employment; current and future aspirations; expectations for future goals; social isolation; normlessness; labelling by parents, friends, and teachers; perceived disapproval by parents, peers, colleagues or partner; counter-labelling; parental discipline; attitudes toward deviance; exposure and commitment to delinquent peers; self-reported delinquency; interactions with law enforcement; victimization; alcohol and drug use; interpersonal violence; and sexual activity.[33]

The collection of specific items measuring self-reported delinquency (SRD) varied between waves. For example, the youth instrument used for the first wave tapped 40 different behaviours to measure SRD, whereas the instrument used for second wave included even more items. Questions were refined and changed across waves (see Bureau of Justice Statistics 1989 for further details). In the present study, considerable effort is made to use items that are consistent across waves rather than those that change.

Data Issues

Unit and Item Non-response

Two types of non-response in survey data can be problematic: unit and item non-response (Maxim 1999:303-305). In all studies, these types of non-response can cause substantial bias in findings. In the case of the NYS, both types of non-response are a concern.

Unit non-response arises because of attrition. As in all longitudinal surveys, attrition of participants occurred over the seven waves of the NYS. The cumulative loss of respondents increased over the years. For example, between the first and second waves, 4% of participants were lost, and this increased to 6% between the second and third waves (Bureau of Justice Statistics 1989:674). The cumulative loss of respondents

[33] The individual survey instruments are available for download through the ICPSR database as part of the study materials for each wave.

was 10.6% for wave four, 13.3% for waves five and six, and 19.8% by the completion of wave seven (Bureau of Justice Statistics 1989:674). It is important to note, however, that cumulative rates of attrition of this size are typical for follow-up surveys over the years and remain within acceptable levels of response.[34] Sample attrition was not always permanent. Most respondents participated in at least two waves.

When attrition occurs, there is a question whether the lost respondents are different from those who continue to participate in the survey. Several studies examine the representativeness of the NYS sample over time and found that the attrition is not related to any specific characteristics within the sample. For example, Menard (2000:552-553) notes the attrition of participants did not substantially change the underlying distribution of the NYS sample in regard to age, sex, ethnicity, class, place of residence, and reported delinquency over the first nine waves of the sample when compared with the first wave of the study. Unit non-response does not appear to have substantially changed the demographic characteristics from those found in the initial sample.

Item non-response occurs when a participant chooses not to respond to either a single item or multiple items in the survey (Maxim 1999:303). This type of missing data can lead to substantial bias and presents many difficulties when trying to analyze data. In this case, however, the amount of missing data for any one NYS wave appears to be minimal. Despite this low level of item non-response, one should nonetheless examine the nature of the missing data.

Options for dealing with unit and item non-response.

The options for dealing with missing data vary by the type of non-response. There are three ways to address unit non-response and the bias that it may cause. One option is to model the attrition and include the results in any substantive modelling; this includes using various sample bias estimators such as Heckman's (1979) selection hazard. The second option is to calibrate or weight cases based on the amount of information provided across different waves of data collection. Alternatively, one could choose to do nothing to

[34] There is no specific rule of thumb regarding amount of acceptable attrition over specified periods of time; however, Scott (2004:30) notes that getting at least 70% of the original sample to respond in follow-up waves is a general bench mark for acceptable attrition. Many would argue that without understanding the mechanisms of attrition, any amount of attrition may be problematic (Maxim 1999: 160).

address the missing data. Each of these techniques will have an influence on the estimation of parameters, and therefore needs to be carefully considered.

In the case of NYS, currently, there are no known variables that are associated with, or can explain, the attrition across waves (i.e., information is at least missing-at-random (Maxim 1999:303)). It is not therefore practical to model attrition, or use sample selection bias estimators (Maxim 1999:189; Winship and Mare 1992:341-342). In fact, previous researchers using the NYS have concluded that these techniques would not be efficient (Maume et al. 2005:253) and could result in very biased parameters (MacMillan 2000:560). Given these issues, selection bias estimators will not be used in this study.

The option of calibrating the data gives greater weights for units with complete information than for those without complete information (Sikkel, Hox and de Leeuw 2009:147). This weighting procedure can be quite complicated with multiple waves of data collection (Sikkel et al. 2009:147). One must often decide whether to choose a weight based on one wave rather than weights based on each wave of data collection. Due to the difficulties with calculating weights across multiple waves and the lack of clarity on how this may influence parameters in the substantive model, the calibration technique will not be used in this study.

The final option available in the case of unit non-response is to do nothing. It seems doing nothing is preferable to the other available options described above. It is not possible to know how different options would influence the parameters, especially given that selection biases are not evident in the data.

There are four potential options to address item non-response: 1) ignoring it or pairwise deletion; 2) casewise deletion; 3) imputing missing information; and, 4) include a measure that indicates which individuals are missing. Unlike pairwise deletion, casewise deletion does not make use of all available information (Allison 1999:8). Yet, casewise deletion maybe more efficient and less biased than pairwise deletion when data are missing completely at random (Allison 2002:6; Maxim 1999:302). Another option available for dealing with missing data is to include missing information as a category within the analyses (Allison 2002:11).

Finally, one could impute the missing information to provide complete datasets for analysis. Several procedures exist to impute complete information for cases. Two

procedures are popular: multiple imputation and hot-deck imputation. According to Allison (2002:27), multiple imputation "produces estimates that are consistent, asymptotically efficient, and asymptotically normal when they are MAR [missing at random]." This technique develops several complete datasets from which one estimates substantive parameters. These parameters and their standard errors are then combined into a single estimate (Allison 2002:29-30). Since this technique assumes multivariate normal distribution, statistical transformations may be necessary to make variables conform to this assumption (Allison 2002:33). In addition, although there are procedures to accommodate strictly categorical variables, they are limited when all or too many variables under examination are categorical (Allison 2002:40). As a result, models must be "small"[35] for this technique to work (Vermunt, van Ginkel, van der Ginkel and Sijtsma 2008:371). Another difficulty with the multiple imputation technique is that different estimates are produced each time the procedure is used (Allison 2002:28), making it difficult to replicate the findings.

Hot deck imputation is a type of non-parametric imputation that works well with large amounts of categorical data (Vermunt et al. 2008:371). This procedure fills missing data with a case which is complete, and has the most similar information to the case with the missing data (Vermunt et al. 2008:372; Maxim 1999:310). This results in the best "guess" of how the respondent may have answered given their similarity to the participant with the complete information. The estimates generated from this type of imputation should be replicable, unlike the estimates from multiple imputation. A handful of studies indicate, however, that this technique may produce biased estimates even when information is considered to be missing at random (Vermunt et al. 2008:372).

Given these difficulties with imputing missing information for categorical variables, like half of those being used in the current study, as well as the inability to ensure that estimated parameters will be less biased than those based on data with missing information removed or accounted for in other manners, imputation is not considered a viable option for the current study.

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[35] Vermunt et al. (2008: 371) note that most multiple imputations for categorical variables cannot exceed the number of variables that could be used to "set-up and process the full multi-way crosstabulation required for log-linear analysis."

The impact of missing information on parameter estimates will be briefly discussed in the results. Two options - pairwise deletion and using missing values as a specific category – will be considered.

Censoring

As a result of the NYS's selection of youth between the ages of 11 and 17, there is a possibility of both right and left censoring in the data. Right censoring is when the event being examined is not captured in the study period, but rather occurs after the study period (Elliott and Menard 1996:38). This type of censoring is generally not as problematic as left censoring, and Elliott and Menard (1996:39) note that this censoring is minimal in the NYS data.

Left censoring occurs when the behaviour of interest is not observed during the study period, but occurred prior to this period (Elliott and Menard 1996:39). For example, a 17 year old participant may have engaged in delinquent behaviour when he or she was 15, but not after. The impact of left censoring on resulting models needs to be considered. In considering this impact, two age cohorts will be examined: individuals aged 11-13 and 14-17 in the initial wave of data collection. This age split roughly corresponds with previous research indicating that the initiation of delinquency prior to the age of 14 is rare and, thus, the likelihood of left censoring in the 11-13 age group would be lower than that in the 14-17 age group. Accordingly, it is possible to compare these two age cohorts and assess the impact of left censoring.

Technique

With longitudinal data, we need to examine both changes within an individual and between individuals over time. Multilevel modeling can examine these changes. This type of modelling allows for the intercept and coefficients to vary by each subject (Twisk 2004:770). By doing this, multilevel modeling corrects for the clustering of responses within individuals over time, which allows for the estimation of correct standard errors and thus correct tests of statistical inference (Rice 2001:28).

In a multilevel model, *t* denotes times of the repeated observations within an individual, traditionally considered as Level 1 (L1), and *i* represents the individual considered as Level 2 (L2) (Hox 2010:79, 83). It is this specification that helps when examining changes within and between individuals over time.

Initially designed for continuous data, multilevel models can also be used for many types of outcomes. The two levels of the model can be estimated as a latent response variable (y^*_{ti}) and although this variable is unobservable, it can be measured indirectly through variables of any distribution (y_{ti}) (Rice 2001:32). For ease of exposition, these models are initially examined in their linear latent form, and a discussion of other types of estimation will follow. The L1 portion of the model, or the level of repeated measures, is defined as:

$$y^*_{ti} = \pi_{0i} + \pi_{1i}T_{ti} + \pi_{2i}X_{ti} + e_{ti}$$

where y^*_{ti} is the latent response variable for individual i measured at time t, π_{0i} is intercept, π_{1i} is the regression coefficient for T_{ti} (which represents the time at which y^*_{ti} was measured), π_{2i} is regression coefficient for X_{ti} (which represent time-varying covariates), and e_{ti} is residual error at Level 1 (Hox 2010:13, 83-84).

The L2 portion of the model, which accounts for the differences between individuals, is defined as:

$$\pi_{0i} = \beta_{00} + \beta_{01}Z_i + u_{0i}$$
$$\pi_{1i} = \beta_{10} + \beta_{11}Z_i + u_{1i}$$
$$\pi_{2i} = \beta_{20} + \beta_{21}Z_i + u_{2i}$$

where π_{0i} is split into a grand mean (β_{00}) and its deviation (u_{0i}), β_{01} is the regression coefficient for the time-invariant covariates Z_i. The following two equations partition the L2 information in a similar manner for the L1 measurement of the time and the time-varying covariates as well, with the corresponding residual errors represented by u. The residual error associated with the individual differences in outcome, the timing of outcome measurement, and time-varying covariates are represented by u_{0i}, u_{1i}, and u_{2i}, respectively. At both L1 and L2, residuals are assumed to be normally distributed with a mean of zero and constant variance and to be independent of the residual error at L1 (e_{ti}) (Hox 2010:13). Combining levels 1 and 2, the final model can be expressed as follows:

$$y^*_{ti} = \beta_{00} + \beta_{10}T_{ti} + \beta_{20}X_{ti} + \beta_{01}Z_i + \beta_{11}T_{ti}Z_i + \beta_{21}X_{ti}Z_i + u_{1i}T_{ti} + u_{2i}X_{ti} + u_{0i} + e_{ti}$$

This model specification is for a linear regression model. This model can be adapted for various types of outcomes including binary and count data. In the current study, count

data are used to examine the occurrence of serious and non-serious criminal behaviour. Generally, when examining counts of behaviour two distributions are available: the Poisson and Negative Binomial. Difficulties often arise when trying to use Poisson distribution because it assumes the mean and variance are equal (i.e., equidispersion) (Long 1997:231). With the type of data used in this study, it is common for the variance of the distribution to exceed the mean (i.e., overdispersion), and to deal with this issue the Negative Binomial distribution is often chosen (Long 1997:249), because the variance of the Negative Binomial distribution exceeds the mean through the inclusion of a dispersion parameter which introduces unobserved heterogeneity to account for the variation (Long 1997:249). For this reason, analyses undertaken in the present study will use the Negative Binomial distribution.

Traditionally when using the Negative Binomial Distribution with panel data such as the NYS either fixed- or random-effects modelling can be used. Fixed-effects models control for all time invariant covariates by examining only the within-person variation of parameters and providing an average estimate for all individuals, meaning that no time invariant measures like gender, ethnicity or social class can be included in the modelling of the dependent variable (Allison and Waterman, 2002). Comparatively, random-effects modelling includes time invariant measures. Given that a focus of the current research is whether gender-specific modelling is necessary, random-effects modelling is appropriate. However, later testing will assess whether fixed- or random-effect modelling is preferred.

Under Negative Binomial Models, the average number of occurrences in a specified period (λ) is estimated using the natural logarithm transformation (Allison and Waterman 2002). For the Random-Effects Negative Binominal Model, the final logistic form of the multilevel model would be expressed as follows:

$$\lambda_{ti} = e^{\delta_i + \beta X_{ti} + \gamma Z_i},$$

where δ is the dispersion parameter.

In both fixed- and random-effects models, exponentials of the coefficients are called the Incidence Rate Ratios (IRR) and are interpreted as relative risk-ratios. For example, an IRR of 1.28 represents an increase of 28% in the likelihood of the outcome

as levels of the independent variable increase. In contrast, an IRR of 0.72 represents a 28% decrease in the likelihood of the outcome as levels of the independent variable increase. It is also possible to estimate the range of the impact of the independent variable on the outcome as well. For example, take an IRR of 1.28, for which the values of the (independent) variable range from 0 to 10. In this case, the range of the impact of the independent variable would be from 1 to 11.8 (1.28^0 to 1.28^{10}). Thus, those with the highest level of the variable would be almost 12 times more likely to experience the event than those with the lowest level of the variable.

Practical Issues in using multilevel models

When working with multilevel models, some important points that must be addressed include incomplete data, centring of data, interaction effects and spacing between surveys. These issues are discussed below in some detail.

Incomplete data.

Beyond adjusting for the correlation between repeated measures, multilevel models are relatively robust in dealing with missing information (Twisk and de Vente 2002:329). Twisk and de Vente (2002:336) note that standard errors of regression coefficients are either under- or over-estimated depending on the type of imputation techniques used. They also note that the analyses on datasets with missing data are comparable to those that had been imputed using longitudinal techniques[36] (Twisk and de Vente 2002:336). The impact of missing data in this study will be discussed briefly in the results.

Centring of data.

Centring is often discussed when dealing with multilevel models. Several issues must be considered in this respect. First, there are three types of centring that are generally undertaken: natural-scale centring, grand-mean centring, and group-mean centring (Raudenbaush and Bryk 2002:31-32). In the present study, there is little need to centre data by natural scale, thus we only need to consider centring by either grand or group mean. Typically, centring on either of these means is to avoid misspecification of the model due to multicollinearity and to aid in the interpretation of results (Raudenbaush and Bryk 2002:31-33). However, the decision to centre variables should not be done

[36] These techniques include substituting non-responses in the current wave with the responses given in the previous waves.

without other considerations. First, it has been shown that there are few differences between models that are grand-mean centred and those of raw scores (Hoffman and Gavin 1998:638). Thus, unless there are issues with multicollinearity or interpretability, there appears to be little reason to grand-mean centre data. Second, some studies note that multicollinearity is not typically high (Paccagnella 2006:81). Although group-mean centring allows a focus on within-individual variation in the random-effects context, some argue that group-mean centring should only be undertaken with the strongest of theoretical reasoning (Snidjers and Boskers 1999:81). This type of centring may stabilize a model, the group-centred model is not equivalent to the raw score model and may not be properly specified (Paccagnella 2006:82-83). Given these issues with centring, only group-mean centring will be considered when evidence of multicollinearity is extreme; otherwise raw scores will be used in the models.

Interaction effects and the testing of the gender invariance hypotheses.

In the present analyses, it is important to assess whether general theories actually account for the criminal behaviour of men and women equally well and whether the central concepts in each of these theories work in similar fashions for men and women. Using multilevel modelling, it is possible to assess whether there are gender differences in the effects of the variable of interest according to different theories. If there are significant interactions between gender and the variables of interest, further analyses will be conducted separately for males and females to assess the importance of specific variables in explaining changes in criminal behaviour over the life course.

Gaps in time between surveys.

Although most of the information in the NYS provides annual estimates, data in Waves Six and Seven were not collected annually. For example, in these two waves, some of the information were collected only for the most recent year rather than for all three years that surveys covered. This imbalance in timing of the information is taken up by the statistical procedure used in the study.

Measures

The following section describes the measures used to assess the ability of four life-course theories to account for the criminal behaviour of women and men. First comes the dependent variable - self-reported criminal behaviour; then comes the description of the

control variables, followed by a description of the measures specific to each theory of criminal behaviour. Any expected interactions between variables, as proposed in specific theories, will also be discussed. In particular, if gender-specific interactions are expected according to the literature, the expected relationships will be discussed. The final section describes the variables, which have been argued to be important in understanding the criminal behaviour of women (i.e., "women-specific" variables). Appendix E describes all the survey items used in the analyses and from which waves those items are drawn. Cronbach's Alpha for all scale measures are presented in Appendix F.

Dependent Variables - Self-reported serious and non-serious criminal behaviour

Given that people who engage in criminal behaviour often engage in different types of criminal behaviour (Moffitt et al. 2001) and that men and women tend to commit different types of criminal behaviour, an examination of only one type of crime is too restrictive for a test of a general theory of criminal behaviour. Thus, the dependent variables are derived from a range of self-reported criminal behaviours[37], as counts of criminal acts engaged in a given year. In addition, they are grouped into serious and non-serious criminal behaviours.

In the NYS, youth were asked about their criminal behaviour at each wave, over a period of 11 years. Each year, the youth were asked "how many times in the last year have you…", followed by a series of delinquent and criminal behaviours. In the present study, only the behaviours that are considered criminal in adulthood and childhood according to the American Uniform Crime Reports as well as those that were consistently measured across all waves are included in deriving the measures of outcome. Fifteen behaviours satisfied the two selection criteria and were divided by seriousness of the act (i.e., felony, theft, and assault vs. all other crimes). The following acts were included in serious criminal behaviour: stole vehicle, stole something worth more than $50, bought or sold stolen goods, attacked someone, involved in gang fights, forced sexual relations,

[37]Measures of self-reported criminal behaviour are considered reliable, although they can differ from official records. Research specifically examining the consistency between the self-reported information provided in the NYS against official records suggests that these two sources of information are generally consistent (Elliott and Ageton 1980:107). In the case of both class and race, few significant differences appeared for self-reported delinquency. Notably, other research has noted that this difference diminishes between men and women and various age groups when using self-reported data (Elliot and Ageton 1980: 95).

strong-armed others, broke into a building. Non-serious criminal behaviour included the following: carried a weapon, stole something worth less than $5, prostitution, sold marijuana, hit a parent, sold hard drugs, stole things worth between $5 and $50.

Responses to these items were coded in different ways across waves. In Wave 1, the response categories were: never (1), once or twice a year (2), once every 2-3 months (3), once a month (4), once every 2-3 weeks (5), once a week (6), 2-3 times a week (7), once a day (8), and 2-3 times a day (9). In Waves 2 through 5, the response codes were: never (1), once a month (2), once every 2-3 weeks (3), once a week (4), 2-3 times a week (5), once a day (6), and 2-3 times a day (7). These same categories were used in Waves 6 and 7 but for the most recent years only (i.e., 1983 and 1986). Different categories were used in the other two years covered by these waves: never (1), 1-2 times (2), 3-11 times (3), and 12 or more times (4). Given such variation in the response categories, each item was re-categorized as a binary measure to ensure consistency across waves in the dependent variables. The annual binary measure of each item has two categories: no behaviours of this type and at least one behaviour of this type. Each of the binary items are then added together to create the respective counts variables of serious and non-serious criminal behaviour. Serious criminal behaviour ranges from 0 to 8 and non-serious criminal behaviour ranges from 0 to 7. The Cronbach's Alpha ranged from 0.49 to 0.71 and 0.51 to 0.64 for serious and non-serious criminal behaviour, respectively.

Control Variables

Four control variables – age, ethnicity, cohort and gender - are included in the analyses, given their importance to the research questions under examination.

Age (Time).

The age of the respondent was obtained for each wave of data collection. Since criminal behaviour may change over time (age) and since time must be represented to assess change, age will be used to represent the passing of time.

Ethnicity.

Due to the relevance of race relations in the United States and racial differences in the positions individuals occupy in a social structure and culture, it is necessary to control for ethnicity. Ethnicity was reported in Wave 1. Responses included the following categories: Caucasian (1), Black (2), Chicano (3), American Indian (4), Asian (5), other (6). About

one in five youths reported an ethnicity different than Caucasian. The responses are dichotomized into Caucasian (0) and Visible Minority (1).

Cohort.

As previously discussed, controlling for cohort is important due to issues with left censoring. A dichotomous variable will be used as this control. Those who were ages 11 to 13 at the first wave of the survey are included in the first category and those 14 to 17 are in the second category.

Gender.

This information was collected in Wave 1 - men (0) and women (1).

Independent Variables based on the General Theory of Crime

Self-control.

Hirschi and Gottfredson (1993) emphasize the reliability of behavioural measures of self-control, and argue later that the best measure would be to count the range of behaviours in which an individual engages (1995:134). As previously noted, Hirschi and Gottfredson (1993) suggested school performance, smoking, drinking, drug use, accident frequency, or joyriding can all serve as indicators of self-control. Furthermore, they contend that self-control is a stable trait that is set by age eight to ten. In the present study, the measure of self-control is time-invariant and taken from Wave 1. This measure is a composite derived from various items such as alcohol use, marijuana use, obscene phone calls, school suspensions, public drunkenness, avoidance of payment, joyriding, disorderly conduct, hitchhiking, cheating, sexual activity, lying about age, and throwing objects at cars. Questions on these behaviours were asked and derived in a manner similar to criminal behaviour. This measure is an additive scale of self-control. The Cronbach's Alpha for this scale is 0.87. Higher scores on this scale indicate lower self-control. It is expected that self-control is inversely related to criminal behaviour and is assumed to be stable over age given that opportunities to commit crimes are available. Furthermore, it is expected that boys will have lower levels of self-control than girls (Gottfredson and Hirschi 1990:148).

Opportunity.

This concept is measured by amount of time spent with friends. Although this measure does not account for the delinquent influences of peers with which individuals spent time,

others (e.g., Burton et al. 1999; 1998) have measured opportunity in this manner previously. This measure is comprised of three variables collected in each wave until the fifth and for the most recent year in Waves 6 and 7. The three variables are: number of weekday afternoons after school and before dinner, number of weekday evenings, and amount of time on weekends spent with friends. Each of these variables is measured on an ordinal scale of 0 to 5. The composite variable is an additive scale. It is expected that opportunity will have an effect on criminal behaviour in conjunction with low self-control. That is, low self-control in conjunction with higher opportunity will increase the likelihood of criminal behaviour (thus, a statistical interaction will be included in models). The Cronbach's Alpha for this scale ranged from 0.80 to 0.93 across waves. Furthermore, it is expected that boys will report more opportunity to commit criminal behaviour than girls (Gottfredson and Hirschi 1990:148).

Subjective family attachment.

Parental attachment is proposed to be related to the development of self-control and when self-control is included in analyses, the relationship between parental attachment and criminal behaviour should be fully mediated[38] by self-control. Given that Gottfredson and Hirschi (1990) argue that low self-control is stable by ages 8 to 10 and that social attachment is not related to criminal behaviour, parental attachment will be treated as time-invariant.[39] In this case, family attachment is measured by the youth's evaluation of their relationship with their family. During Wave 1, youth were asked about their agreement with the following statements: I feel like an outsider with my family; sometimes, I feel lonely when I am with my family; my family doesn't take much interest in my problems; my family is willing to listen if I have a problem; and I feel close to my

[38] The theory proposes a mediated relationship that can be addressed directly using technique like Structural Equation Modeling; however, given that this technique is not used in the present study, the mediation effect is assessed indirectly using the technique outlined by Baron and Kenny (1986). Four steps assess whether mediation is occurring. First, a relationship must exist between the initial variable and the outcome. Second, there must be a correlation between the initial and mediating variables. Third, the mediator and the outcome must be related while controlling for the initial variables. Finally, assess whether the mediator completely diminishes the relationship between the initial variable and the outcome. If it does, it is a test of the spuriousness of the initial variables; if not, the mediation is only a partial mediation.

[39] Besides opportunity for criminal behaviour, self-control is the only factor posited to affect criminal behaviour. Furthermore, because self-control is considered to become stable by ages 8 to 10, there is no need to measure any other factors, whether time-varying or not, to assess the theory. Parental attachment is included as time-invariant in order to test the hypothesis that self-control fully mediates the relationship between family attachment and criminal behaviour as proposed in the General Theory of Crime.

family. The response options were: strongly agree (5), agree (4), neither agree nor disagree (3), disagree (2), or strongly disagree (1). The first three items are reverse coded so that a higher score indicates greater attachment. The Cronbach's Alpha for this scale is 0.72.

Independent Variables based on Interactional Theory

Parental social class.

Thornberry and Krohn (2001:295) suggest that welfare dependence can measure social class, although some may argue that this is a weak proxy for social class and is a better indicator of poverty. During Wave 1, parents were asked, "has your family received any money, food stamps, welfare, or other public assistance during the last year?" Parents not receiving some form of public assistance in the past year are categorized as higher class and those reporting public assistance as lower class (1).

Objective family attachment.

From the Interactional Theory point of view, Thornberry (1987) discussed parental attachment as being dynamic and changing over time (i.e., time-varying). In this case, parental attachment is measured by how much time a youth reported spending with family. This variable is comprised of three items, collected in each wave; this information was collected only for the most recent year in Wave 6 or 7. The items were: number of weekday afternoons after school and before dinner, number of weekday evenings, and amount of time on weekends spent with family. All these items were measured on an ordinal scale of 0 to 5. The composite variable is an additive scale with higher scores indicating greater attachment to parents/family. The Cronbach's Alpha for this scale ranges from 0.69 to 0.82 across waves. It is expected that higher attachment will be associated with less criminal behaviour.

According to Jang and Smith (1997:323) the process of individuation is different for girls and boys (i.e., girls and boys will spend less time with their families at differential rates over time). Therefore, it is expected that over time boys will report less family attachment in comparison to girls. This in turn will be associated with differences in the likelihood of criminal behaviour of girls and boys over the life-course.

School commitment (attachment).

Thornberry (1987:866) suggests that commitment to school can be measured by a child's attachment to teachers. In Wave 1, the youth were asked about how much they agreed with the following statements: teachers don't call on me, even when I raise my hand; I often feel like nobody at school cares about me; I don't feel as if I really belong at school; even though there are lots of kids around, I often feel lonely at school; and teachers don't ask me to work on special projects in the classroom. The responses included: strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), to strongly agree (5). This time-invariant measure is an additive scale with lower scores indicating greater attachment to school. The Cronbach's Alpha for this scale is 0.64. It is expected that greater attachment will decrease the likelihood of criminal behaviour.

Commitment to conventional activities.

Thornberry (1987:882) noted that commitment to conventional activities could be measured by participation in school, work, and even military service. In the NYS, youth were asked about their participation in school and work (including military service) for each year. The youth were asked whether they had attended a regular school and if they had a job. These two variables are combined into a single time-varying measure reflecting whether they were neither working nor attending school (0), attending school only (1), working only (2), and both attending school and working (3). It is expected that those reporting conventional activity are less likely than those without any conventional activities to engage in criminal behaviours.

Beliefs in conventional values.

Thornberry (1987:866) noted that conventional beliefs could be measured by a youth's commitment to "education, personal industry, [and] financial success." In Wave 1, two items tap this concept; the youth's evaluation of the importance of having a good job and going to college. The responses included very important (5), somewhat important (3), and not important at all (1). It is expected that those who rate either item as being important are less likely to behave criminally than those rating these items as not important.[40]

[40] Initially, it was intended to combine these two items into a single additive scale. However, the Cronbach's Alpha for this scale was very low (0.24). They were left as they were.

Attachment to delinquent peers.

Thornberry (1987:866) notes that attachment to delinquent peers and their support of delinquent values fosters criminal behaviour over the life-course. This variable is measured by the number of friends engaging in a range of delinquent activities in the past year as reported by the youth. The range of behaviours included: using marijuana, stealing something worth less than $5 and hitting someone. The response options were: all of them (5), most of them (4), some of them (3), very few of them (2), and none (1). These items were collected in each wave, but only for the most recent years in Waves 6 and 7. Those who did not report the presence of friends were given a score of zero combined with those who report having no delinquent friends in each of the three items and served as the reference group. The resulting measure is time-varying and has been broken into three categories: no delinquent peers (scores of 0 and 3), few delinquent peers (scores of 4 through 6), and some delinquent friends (scores greater than 6). The resulting two dummy variables – few delinquent and some delinquent peers have no delinquent peers as the reference (0). It is expected that greater attachment to delinquent peers is predictive of criminal behaviour.

Commitment to family of procreation.

Thornberry (1987:879-882) did not address how to operationalize commitment to one's own family created through marriage, although this process unfolds over the adult portion of the life-course. In this study, two variables measure this commitment, and it varies over time: the respondents' marital status and whether the respondent reported the presence of children in the home. In Wave 7, the date of marriage (or remarriage) and divorce was collected for each respondent. Additionally, the respondents gave the birthdates of their children. From this information, two separate time-varying variables were constructed. The first variable reflects whether the respondent was in marital union or not in any given year (the latter including those who were never married, widowed, divorced). It is expected that the married will be less likely than those who are not married to engage in criminal behaviour.

The second variable reflects whether children were present in the home of the respondent. This variable was constructed using the birthdates of children. In each year, if the respondents did not indicate the birth of children, the presence of children was coded

as zero and if the respondents indicated the birth of children, the presence of children was coded as 1. Thus, the presence of children is a time-varying and dichotomous variable with yes (1) and no (0) categories. It is also expected that individuals with children will be less likely to behave criminally than those without children.

Gender interactions with these two variables have been hypothesized by Giordano et al. (2002). It is expected that marriage and children have a larger "protective" effect on the criminal behaviour of women than for men.

Independent Variables based on Dual Taxonomy Theory

Neuropsychological deficits.

Moffitt (1993:679) suggested failures in school as one of the many indicators of neuropsychological deficits, although it is one of the weaker proxies for this measure. Wave 1 of the NYS collected information about age and grade, which can be combined to derive the variable "grade failure." For example, those who are aged 11 or older and report being in a grade lower than 5, or those aged 12 or older and report being in grade 5 or lower, etc. are considered as experiencing a school failure (1). Those in an age-appropriate grade are not considered to have neuropsychological deficits (0). This variable is not conceptualized to be time-varying. It is expected that individuals with deficits will be more likely than those without deficits to be involved in serious criminal behaviour especially in conjunction with family adversity.

It is expected that fewer women than men will persistently report serious criminal behaviour over the life course because fewer women have neuropsychological deficits than men; however, it is expected that similar proportions of boys and girls will report offending during the adolescent period of the life course only (Moffitt 2006:558).

Adverse family environment.

Moffitt (1993:681) notes that family adversity can further exacerbate neuropsychological deficits and lead to persistent offending over the life-course. Moffitt (2001c) and Nagin et al. (1995) measured this concept through type of discipline and parental deviance. In the NYS, parents were asked if they directly or indirectly endorsed a range of criminal behaviours and how they discipline their children. Parents were asked, "how wrong is it for an adult like you to..." cheat on income taxes, steal something worth more than $50, use marijuana or hashish, be drunk in a public place, purposely damage or destroy

property that did not belong to you, steal something worth less than $50, hit or threaten to hit someone without reason, break into a vehicle or a building, have sexual intercourse with someone outside of marriage, and use hard drugs such as heroin, cocaine, and LSD. This measure is additive and higher scores indicate greater parental deviance.

Parents were also asked to choose between one of four discipline options from three different groups of options. The choices in the first group included: point out the hurtful consequences of my child's behaviour; never accuse my child unfairly, even if I am angry with him or her; take away my child's privileges; or demand that he or she correct the damage he or she has done. The second group included: discuss the importance of my child acting in a mature and thoughtful way; let my child know that I am disappointed by his or her behaviour; threaten my child with discipline from someone else; or yell at my child. The final grouping included: explain that he or she should accept responsibility for his or her behaviour and request that he or she make up for it; discuss his or her behaviour with him or her as well as my reasons for being upset with it; hit or threaten my child; or send my child to his or her room. The first two responses in each group indicate an inductive style of parenting[41] and the last two a non-inductive style. The original investigators combined the scores into a single item for the respondent with three outcome categories: inductive (3), semi-inductive (2), and non-inductive (1) (Cronbach's Alpha was not provided). It is expected that higher scores on this variable will be related to lower family adversity and thus less likely to be associated with serious criminal behaviour. Taken together, family adversity and neuropsychological deficits should be related to serious criminal behaviour.

Peer rejection and knowledge of delinquent peers.

Moffitt (1997:27) notes that for youth to become involved in criminal behaviour during adolescence they need to be aware of the delinquent behaviour of their peers. This is measured by whether the youth reported any of their friends engaging in delinquent activities in the past year. These activities included using marijuana, stealing something worth less than $5 and hitting someone. The response options were: all of them (5), most

[41] Inductive style of parenting is when "the parent points out the painful consequences of the child's act for the parent or others" (Hoffman and Saltzstein, 1967: 46). Non-inductive parenting style does not include these techniques and semi-inductive styles include the use of both non-inductive and inductive techniques. Inductive parenting is preferred over other styles (Hoffman and Saltzstein, 1967: 46).

of them (4), some of them (3), very few of them (2), and none (1). These items were collected in each wave but only for 1983 and 1986 in Waves 6 and 7. Those who did not report the presence of friends[42] were grouped into one category. Those with non-delinquent peers made up another category, and those with delinquent peers made up the third category. Thus, two dummy variables are used, those with delinquent peers as the reference category who were compared with those with no peers at all and those with non-delinquent peers respectively.

With these dummy variables, it is possible to assess the impact of having no friends at all, which could reflect peer rejection. Moffitt (1997) argued those who are not aware of delinquent peers are unable to imitate criminal behaviour. Thus, it is expected that those who report no peers will also consistently report no criminal behaviour over the life-course. These dummy variables also allow an examination of the relationship between awareness of delinquent peers and adolescent-limited offending. As previously noted many adolescents imitate the criminal behaviours of the life-course-persistent offenders in an attempt to gain independent lifestyles (Moffitt 1997:31). Thus, it is expected that knowledge of delinquent peers will be related to non-serious rather than serious criminal behaviour.

Independent variables based on Age-graded Theory of Informal Social Control

Structural background factors.

Sampson and Laub (1993) draw attention to several background factors related to position in social structure that have an indirect effect on criminal behaviour. These factors include low family socioeconomic status, household crowding, disruption of two-parent home, size of family, whether parents were immigrants, residential mobility, employment of mother, general deviance of parent, criminal record of parents, and whether the parent engaged in chronic episodes of intoxication. Several of these factors were measured at Wave 1 and are included in the present study.

Low socioeconomic status is measured by reliance on public assistance in the past year. Parents who received public assistance are categorized as lower class and those who did not as higher class. *Disruption of two-parent household* is measured by whether the

[42] Waves 1 through 5, asked only those youth who reported that they "ran around with a particular group of friends" about the delinquent behaviour of their friends.

youth lived in a two-parent home or not. *Number of siblings* is measured by the number of children under 18 living with the parent respondent. *General deviance of parent* is measured by an additive scale of their attitudes favouring: cheating on income taxes, stealing something worth more than $50 up, using marijuana or hashish, being drunk in a public place, purposely damaging or destroying property that did not belong to them, stealing something worth less than $50, hitting or threatening to hit someone without reason, breaking into a vehicle or a building, having sexual intercourse with someone outside of marriage, and using hard drugs such as heroin, cocaine or LSD. Any endorsement of deviance means the parent will be categorized as deviant and all others as non-deviants.

It is expected that those who are of low socioeconomic status, a single-parent household, have more siblings and deviant parents will be more likely to be involved in criminal behaviour.

Individual differences in temperament.

According to Sampson and Laub (1993:88), individual differences in temperament can be measured by whether a child is considered to be difficult to deal with, the presence of temper tantrums, and the early-onset of conduct disorder. The NYS does not provide information on temper tantrums; however, difficult temperament of a child can be measured by whether parents agreed that their child was a "bad kid." Response options include: strongly agree (5), agree (4), neither agree nor disagree (3), disagree (2), or strongly disagree (1). A higher score indicates a more difficult child.

A second measure of differences in temperament is early-onset of conduct disorder. Generally, multiple serious violations of rules are considered symptoms of conduct disorder as classified in the DSM-IV (American Psychiatric Association: 85-91). In the current study, these early-onset conduct disorder behaviours include: stealing a motor vehicle, stealing something more than $50, setting fire to property, attacking someone, being in a gang fight, sexual assault, breaking into a vehicle or building, using force on someone else to obtain something, hurting someone to get sex, and selling hard drugs. In Wave 7, youth were asked whether they had ever engaged in these behaviours and the age they initiated the behaviour. A youth initiating any of these behaviours before

the age of 12[43] are categorized as having early-onset conduct disorder and all other youth are not considered to have early-onset conduct disorder.

It is expected that individuals with difficult temperaments and individuals with early criminal behaviour are more likely to offend over the life-course. Furthermore, it is expected that these individuals' differences in temperament are mediated by informal social control in adulthood.

Social control by family.

Social control in the family is any act that changes the likelihood of the compliance to prosocial rules (Cusson 2002). Sampson and Laub (1993:73-74) theorized three elements affect the social control process of the family: lack of supervision, harsh and erratic discipline, and parental rejection. Using the NYS, there is no direct measure of supervision; however, it can be indirectly measured through time spent with family. It is assumed that spending time with family includes time supervised by parents. In the NYS, "supervision" is measured by three variables collected in each wave- number of weekday afternoons after school and before dinner, number of weekday evenings, and amount of time on weekends spent with family. It should be noted, however, this information was only collected for the most recent years in Waves 6 and 7. These items were measured on an ordinal scale of 0 to 5. The composite variable is an additive scale with higher scores indicating more supervision by parents. The Cronbach's Alpha ranges from 0.69 to 0.82 across waves. It is expected that those who spend more time with their family are less likely to offend over the life-course.

As described above, a global rating of parental discipline as inductive (3), semi-inductive (2), non-inductive (1) is included here. Lower scores indicate less desirable types of discipline styles are related to increased likelihood of offending.

Finally, rejection by parent is measured by a youth's evaluation of their relationship with family. In Wave 1, youth were asked of their agreement with these statements: I feel like an outsider with my family; sometimes, I feel lonely when I am with my family; and my family doesn't take much interest in my problems. The response options were: strongly agree (5), agree (4), neither agree nor disagree (3), disagree (2), or

[43] Although this age is higher than that of Sampson and Laub (1993), which was only eight years, this difference in cut-off age reflects the different samples of the studies (i.e., offender vs. general population).

strongly disagree (1). A higher score indicates greater parental rejection. The Cronbach's Alpha for this scale is 0.72. It is expected those experiencing parental rejection are more likely to behave criminally.

Social control by school.

Sampson and Laub (1993:106) suggested this concept could be measured by whether the youth were attached to school. Those who dedicate a lot of time to school would be considered to be more highly attached to this social institution. In this case, a time-varying measure is created using the following three variables: number of weekday afternoons, evenings, and amount of time on weekends spent on school work. This information was collected in each wave but only for 1983 and 1986 in Waves 6 and 7. Responses included very important (5), pretty important (4), somewhat important (3), not too important (2), and not important at all (1). Those not in school were coded as 0. The composite measure is additive and higher scores indicate more involvement in and attachment to school. The Cronbach's Alpha ranged from 0.53 to 0.61 across waves. It is expected those who have greater involvement in school will be less likely than those with lower involvement to report criminal behaviour.

Delinquent peer influence.

Similar to Sampson and Laub (1993), attachment to delinquent peers is measured by the number of their friends reported to be engaging in specific delinquent activities in the past year (see page 82 for full detail). The resulting measure is time-varying and has been broken into three categories: no delinquent peers (scores of 0 and 3 (i.e., reporting no delinquent peers on the three items), few delinquent peers (scores of 4 through 6), and some delinquent friends (scores greater than 6). The resulting two dummy variables – few delinquent and some delinquent peers have no delinquent peers as the reference (0). It is expected that greater attachment to delinquent peers is predictive of criminal behaviour.

Cumulative consequences of incarceration.

Sampson and Laub (1993:165) contend that incarceration increases the likelihood of criminal behaviour in the future. In Wave 7, the respondents provided the years in which they had been incarcerated as juveniles and adults. This information is used to create a time-varying measure to indicate years in which youth were incarcerated or not.

Adult social bonds.

Sampson and Laub (1993:248) contend that attachment to labour force and romantic partner would lead to positive changes in criminal behaviour during adulthood. A combination of job stability and occupational attainment comprised the measure for attachment to labour force (Sampson and Laub 1993:127). Employment is captured by a time-varying measure. In each wave, the youth were asked if they had a job or not. Furthermore, the importance of their job was assessed by asking how important it was for the youth to have a job. Responses included very important (5), pretty important (4), somewhat important (3), not too important (2), and not important at all (1). Those who did not have a job were given a score of zero on the scale. This measure is only available for the most recent years in Waves 6 and 7. It is expected that employment and those who rate their job as important are less likely to report offending over the life-course. Further, it is expected that employment and high attachment to employment will explain differences in the criminal behaviour of men more so than the criminal behaviour of women (see Giordano et al. 2002).

Sampson and Laub (1993) suggest that attachment to romantic partner affects criminal behaviour in adulthood. Two time-varying measures assess attachment to romantic partner: being married and importance of activities with partner. The first variable reflects whether the respondent was married throughout a given year or not. It is expected that those who are married are less likely than those who are not to engage in criminal behaviour.

Beginning in Wave 4, respondents were asked how important the activities with their partners were. The response options included: very important (5), pretty important (4), somewhat important (3), not too important (2), and not important at all (1). Those who were not married were given a score of zero. To measure the impact of quality of attachment to spouse on criminal behaviour, analyses are conducted only using information from Wave 4 or later. It is expected that those who report greater attachment to partners (i.e., felt activities with spouse were important) will also be less likely to be involved in criminal behaviour than those who report less marital attachment.

Independent variables that have been argued to be specific to the explanation the criminal behaviour of women.

Several authors have argued that a range of factors is necessary to properly account for the criminal behaviours of women. As previously noted, experiences of sexual and physical abuse (Giordano et al. 2002; Katz 2000; Chesney-Lind 1989), agreement with traditional gender roles (Heimer 1996) and pregnancy or presence of children (Giordano et al. 2002) are expected to be related to criminal behaviour among women.[44] These factors are not included in the previously discussed models. With the exception of pregnancy, these factors can also be experienced by men. Thus, it is unclear whether these factors will explain better the criminal behaviour of women only or whether they will explain better the criminal behaviour of both men and women.

Physical assault.[45]

Two measures are included to assess the impact of physical abuse on criminal behaviour. These items were collected in each wave and for only the most recent year in Waves 6 and 7. The first item asked youth how many times they had been beaten up[46] by their mother or father in the past year. Similarly, the second item asked how many times in the past year they had been beaten up by someone other than their parents. These two items are assessed separately to understand their individual effects. It is expected as the number of physical assaults experienced increases so does criminal behaviour.

Sexual assault.

During each wave, respondents were asked if they had been sexually attacked (or if an attempt to do so had been made). This information was only collected for the most recent years in Waves 6 and 7. It is expected as the number of sexual assaults increases so will criminal behaviour.

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[44] Substance abuse has also been noted to be especially important in explaining the criminal behaviour of women. However, the information on substance use was not collected consistently over time and therefore it is not possible to examine this using the NYS.

[45] Sexual and physical abuse have been posited to be more important to the criminal behaviour of women than that of men because women are more likely than men in the correctional system to report experiences of abuse (Katz 2000:635).

[46] The term beaten up is in the original phrasing of the question, it is taken to mean physically assaulted.

Gender socialization, attitudes favouring criminal behaviour, and perceived disapproval of criminal behaviour by others.

Heimer (1996) argued that gender socialization would have a greater indirect impact on the criminal behaviour of women than of men because women perceive greater disapproval of criminal behaviour from parents and peers and also are less likely to display attitudes favouring criminal behaviour than men. Thus, in general, women are less likely than men to report engaging in criminal behaviour. This study, therefore, examines the impact of gender socialization, perceived disapproval of criminal behaviour by others and attitudes favouring criminal behaviour.

Information on gender socialization was collected in Wave 2. Youth were asked about their agreement with several statements regarding gender roles. The items included are the following: in general, the father should have greater authority than the mother in the bringing up of the children; women with children should not work outside the home unless there is no one else to support the family; women are too emotional to solve problems well; in a marriage, it is the woman's responsibility to care for children and to take care of the home; and women are physically and emotionally weaker than men and therefore need male protection and support. The responses were coded as: strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), to strongly agree (5). The composite variable is an additive scale with higher scores indicating greater endorsement of traditional gender roles. The Cronbach's Alpha for this scale is 0.62. It is expected that greater support of traditional gender roles will respectively increase and decrease the likelihood of criminal behaviour of men and women.

Perceived disapproval of criminal behaviour by others is measured by two items. In all waves, the disapproval of parents and peers were measured. Responses were coded as strongly disapproved (5), disapproved (4), neither approved nor disapproved (3), approved (2), and strongly approved (1). The different sources of disapproval may vary over the life-course and thus, the measures are time-varying, additive scales. Higher scores indicate greater perceived disapproval of criminal behaviour by parents and peers. Greater disapproval is expected to decrease the likelihood of criminal behaviour over the life-course. It is also expected that the addition of perceived disapproval fully mediates

the relationship between gender socialization and criminal behaviour. The Cronbach's Alpha for the items ranged from 0.79 to 0.89.

Similar to perceived disapproval, attitudes favouring criminal behaviour were assessed in most waves except for the years 1981, 1982, 1983, and 1984. Individuals were asked how wrong it is for a person of their age to destroy property, hit someone, break into a vehicle, sell hard drugs, and steal something worth more than $50. The range of response options included: very wrong (4), wrong (3), a little bit wrong (2), and not wrong at all (1). The items were reverse-scored and combined into an additive scale. Higher scores indicate greater endorsement of criminal behaviour and are expected to increase the likelihood of criminal behaviour over the life-course. The Cronbach's Alpha for this scale ranged from 0.75 to 0.86.

Pregnancy.

Giordano et al. (2002), as with Thornberry (1987), argued that the presence of children may discourage involvement in criminal behaviour. Going beyond these authors, it is possible to examine the effect of pregnancy on the criminal behaviour of women. Female respondents in Waves 6 and 7 were asked about their pregnancies, and the years in which they occurred. From this information, a time-varying measure is created indicating whether female respondents were pregnant or not in any given year. It is expected pregnancy will be associated with decreases in criminal behaviour. The effect of pregnancy are expected to be short-term whereas the presence of children is expected to have longer term effects.

Specific Analyses

Missing Data Analyses

A brief discussion of missing data is provided in the results section. All bivariate and multivariate results presented have missing information excluded. If missing information has an impact on the final models, it is discussed at the time.

Descriptive Analyses

Descriptive statistics are presented for the whole sample, males and females. For each item, frequency and percentage distributions, means or proportions, confidence intervals, and percentage missing are provided. For time-varying variables, an examination of change over time is provided.

Inferential Analyses

Several inferential analyses examine the validity of the four life-course theories of criminal behaviour. Information obtained from bivariate analyses are used to build the "best" multivariate models for each of the theories, by ordering the bivariate relationships from the smallest to the largest Bayseian Information Criterion (BIC)[47] in their entry to the model. If the addition of each new variable is not accompanied by a significant decrease in the BIC, the variable is removed from the model and the variable with the next lowest bivariate BIC is entered into the model. This process is repeated until all measures of a given theory have been tested in the multivariate model. The resulting "best" model will have only those variables that are effective in explaining criminal behaviour.

Several multivariate models are examined. First, the validity of each theory is examined with gender as a control variable and the "best" model is found. Second, the best model is examined with gender interaction terms to assess the need for separate models by gender. In comparison to their interaction counterparts, building models separately by gender allows for a more intuitive understanding of criminal behaviour over the life-course, when interactions are significant.

The next round of analyses adds the women-specific variables to each model of the previously tested life-course theories of criminal behaviours. The impact of these additional variables (with the exception of pregnancy) is assessed for both men and women. These analyses provide insights on whether gender-specific theories of crime are necessary or a more integrative general theory can better account for the criminal behaviour of both men and women simultaneously.

Finally, a range of additional analyses examine the relevance and importance of the Random Intercept in the Random-Effects Negative Binomial Models. First, it has been argued that it is unnecessary to build Random-Effects Models if the estimates arising from the Fixed-Effects Models are at least as consistent as those arising from the Random-Effects Models (see for example, Allison and Waterman 2002). The Durbin-Wu-Hausman (better known as the Hausman test) is designed to assess whether the

[47]The use of BIC helps identify the model that most closely reflects the observed data. A smaller BIC value indicates a better model. The BIC value can be used to compare any models.

estimation of a Random-Effects Model is almost as good (i.e., parameters are as consistent) as a Fixed-Effects model (Rabe-Hesketh and Skrondal 2008:122-124). The Hausman statistic uses the χ^2 distribution with degrees of freedom being equal to the number of covariates being examined. If the Hausman statistic is significant, the coefficients of the two models are not considered to be consistent and the Fixed-Effect Model would be pursued over the Random-Effects Model. Hausman tests are conducted for final models only.

The inclusion of the Random Intercept in the Negative Binomial Model allows us to evaluate the relevance of unobserved heterogeneity. If the Random Intercept is significant, it suggests that factors that would account for this unobserved heterogeneity have been left out. Further analyses are necessary if all of chi-square values associated with the Random Intercepts remain significant. In this case, a fully integrative model (i.e., a model that would include all of the significant variables from each of the tested models) is examined. In addition, past behaviours (i.e., state dependence) are crucial in explaining future behaviours and multilevel models can examine the effects of past events. Using a lagged response model, we can estimate how much of the variation in the Random Intercept is accounted for by previous behaviours. Therefore, if the chi-square associated with the Random Intercept remains significant in the fully integrative model, then the lagged effects will be examined.

CHAPTER 3: RESULTS

This chapter unfolds in three major sections. First, sample attrition is focussed on and where pertinent the effect of missing data is discussed. Second, there is a focus on serious criminal behaviour, and finally, non-serious criminal behaviour is examined.

The last two major sections are further divided into four subsections. The effect of the life-course theories on both serious and non-serious criminal behaviours are at first considered individually, as well as the effect of the proposed women-specific measures. The next subsection focuses on the combined effects of the life-course theories and women-specific measures. Finally, in an attempt to develop the best model, an examination of an integrative model (i.e., the most predictive measures of all of the measures examined thus far) and lagged effects as well will be done.

Attrition

To assess the overall impact of non-response, the distribution of various demographic indicators across the waves was examined, the attrition of the longitudinal sample was examined. Overall, the non-response through attrition is tolerable; 71.5% of the participants responded to all waves of the survey (see Appendix G, Table 1[48]) and only 1.7% responded to only one wave of the survey. The remainder of the participants responded to at least two waves (26.8%).

The distributions of age, gender and ethnicity were examined for each wave of the survey for all respondents together, and then for men and women separately (see Appendix G, Tables 2 through 7). Across the majority of waves, there are gender differences in survey response patterns (see Appendix G, Table 2). For example, men and women respond in similar proportions in Waves 1, 2, 3, and 5; however, women are slightly more likely than men to respond in the Waves 4, 6, and 7: 91.4% of women compared to 87.7% of men responded in Wave 4 (χ^2 (1, n=1725) = 64.3, $p < 0.05$). This differential grew over the next two waves, with 90.0% of women and 84.0% of men responding in Wave 6; the corresponding proportions are 84.6% and 76.5% in Wave 7.

[48] Appendix G, Table 1 provides the number of responders and non-responders at every wave of the survey but also considers the pattern of response across the Waves. For example in the first row, we can see that 1,233 people responded to all waves of the survey, whereas 29 responded only to the first wave. We can also see that of the original 1,725 respondents, 70 did not respond to the second wave of the survey and of these 49 did not respond to Wave 3 and 21 did.

The distribution of age remains relatively constant across the waves as noted in previous research (see Appendix G, Table 3 through Table 5). Thus, there is little evidence to suggest that overall distribution of age changed because of differential attrition.

In most waves, rates of non-response do not vary by ethnicity. Overall, there are no differences in the rates of responses by ethnicity in Waves 1, 4, 5 and 6. In Waves 2, 3, and 7, Caucasians are more likely than visible minorities to respond. While the differences in response by ethnicity are relatively small in Waves 2 and 3, the difference is quite large in Wave 7 (Caucasians: 82.7%, Visible Minority: 71.2%, χ^2 (1, n=1725) = 24.3, $p < 0.05$). More specifically, among women, Caucasians are more likely than visible minorities to respond in Wave 7 (87.5% vs. 73.1%, χ^2 (1, n=1725) =20.3, $p < 0.05$). Among men, however, Caucasians are more likely than visible minorities to participate in Wave 2 (96.5% vs. 93.1%, χ^2 (1, n=1725) = 4.4, $p < 0.05$), Wave 3 (95.4%, vs., 89.2%, χ^2 (1, n=1725) = 10.7, $p < 0.05$), and Wave 7 (78.4% vs. 69.6%, χ^2 (1, n=1725) = 6.9, $p < 0.05$).

Overall, on the distributions of gender, age, and ethnicity change relatively little over the waves of the survey, although attrition was occurring differently among some groups at different points in time[49]. In the majority of waves, there are no significant differences in the rates of response by gender, age, and ethnicity. Nonetheless, analyses were conducted with missing information ignored as well as explicitly included to ensure that these types of attrition do not dramatically affect the findings. These findings will be noted where appropriate.

Dependent Variable: Count of Self-reported Serious Criminal Behaviour

The present study examines two dependent variables. The first is the count of self-reported serious criminal behaviour in any given year and the second is the count of non-serious criminal behaviour, which is discussed later. Regardless of the type of criminal behaviour examined, less than one-third of men and one-fifth of women report engaging

[49] A random-effects logistic regression was also used to examine attrition. This regression provided similar findings as the bivariate analysis shown above. Namely, older individuals, men and visible minorities were more likley to become non-respondents over time than individuals who were younger, Caucasian or female. The independent variables of the theories were not associated with attrition.

in criminal behaviour over the past year in any of the waves. Generally, men report double the annual mean of criminal behaviour, whether serious or not, of women.

Typically, both men and women report serious criminal behaviour less often than non-serious criminal behaviour across all waves of the survey. Although the number of serious criminal behaviours can range from 0 to 8, the mean number of serious criminal behaviours ranges from 0.22 to 0.59 for men and from 0.05 to 0.25 for women (see Table 1). The distribution of this variable is highly positively skewed due to the high percentage of individuals who do not engage in any serious criminal behaviour, and accordingly the variance is larger than the mean. The mean decreases over time (or waves). Among men, the mean declined steadily, reaching significantly lower values in Waves 5, 6, and 7 than in Wave 1. The decline among women is quite steep, and all successive means are significantly lower than those in Wave 1.[50] Again, reflective of the age-crime relationship, the mean for both men and women decreases with age, and women "age out" of serious criminal behaviour more quickly than men. At all waves, men report a mean three to four times higher than women. This finding reflects the well-known gender gap in criminal behaviour.

To ensure that cohort does not have an impact on serious criminal behaviour, the means were examined by age across waves. There are subtle and significant differences among both men and women in reporting serious criminal behaviours over time and age (see Appendix G, Table 7). For example, men aged 11 and 12 in the first wave of the survey reported a mean lower than that of men at age 15 in the first wave (respectively 0.37 and 0.37 vs. 0.92). Based on these findings, further examination of the use of cohort as a control are undertaken in the bivariate and multivariate analyses.

The following sections examine the explanatory power of each of the life-course theories of criminal behaviour on self-reported serious criminal behaviour. The impact of the women-specific measures is also discussed.

[50]Although the proportion of missing information increases across waves, the decline in the reported mean is not related to this increase. The mean number of serious criminal behaviours at any waves was not significantly different between those who responded at each wave and those who did not.

Table 1. Mean, 95% confidence interval, and test of gender differences in serious criminal behaviour among men and women

		Men (*n*=918)	Women (*n*=807)	*F* (*df* $_1$, *df* $_2$)
Wave 1	**Mean (95% CI)**	0.59 (0.52-0.67)	0.25 (0.19-0.30)	51.2***
	% Missing	0	0	(1, 1723)
Wave 2	**Mean (95% CI)**	0.49 (0.43-0.56)	0.13 (0.10-0.16)	88.5***
	% Missing	4.4	4.0	(1, 1648)
Wave 3	**Mean (95% CI)**	0.47 (0.40-0.54)	0.10 (0.07-0.13)	85.3***
	% Missing	6.0	5.6	(1, 1623)
Wave 4	**Mean (95% CI)**	0.46 (0.39-0.53)	0.12 (0.09-0.16)	63.6***
	% Missing	12.3	8.6	(1, 1538)
Wave 5	**Mean (95% CI)**	0.38 (0.31-0.45)	0.11 (0.07-0.14)	46.9***
	% Missing	14.3	11.9	(1, 1491)
Wave 6	**Mean (95% CI)**	0.30 (0.25-0.36)	0.07 (0.05-0.10)	56.3***
	% Missing	16.2	10.0	(1, 1492)
Wave 7	**Mean (95% CI)**	0.22 (0.17-0.27)	0.05 (0.03-0.60)	47.7***
	% Missing	23.7	15.6	(1, 1379)

Note. CI= confidence interval; *df* =degrees of freedom.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Life-course Theory: a) General Theory of Crime

Univariate distributions

The General Theory of Crime is the most parsimonious of the four theories examined here. This theory examines three variables: self-control, parental attachment, and opportunity. An interaction between opportunity and self-control is also theorized. Both self-control and parental attachment are theorized to be time invariant measures. As hypothesized, self-control is lower among men than among women (3.8 vs. 2.9, t (1723) = 6.46, $p < 0.001$) (see Table 2 – this variable ranges from 0 to 14 with higher scores indicating lower self-control). The average score on the subjective parental attachment scale (values can range from 5 to 25) is 20 and there are no differences by gender.

Table 2. Distribution of time-invariant measures of the General Theory of Crime

	Self-Control			Parental Attachment		
	Men	**Women**	**t-test (*df*)**	**Men**	**Women**	**t-test (*df*)**
Mean (*sd*)	3.8 (3.2)	2.9 (2.7)	$t_{(1723)}$= 6.5***	20.1 (2.8)	19.9 (3.2)	$t_{(1621)}$= 1.3
Missing % (*n*)	0.3 (6)	0.3 (6)		0.8 (7)	0.6 (5)	

Note. sd=standard deviation; *df* = degrees of freedom
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Opportunity is the only time-varying measure of the theory (see Table 3). This scale ranges from 0 to 17 with an average ranging from 7 to 9 over time. The level of opportunity is quite high in the group. On average, women report fewer opportunities than men (9.0 to 6.7 vs. 9.1 to 7.4); in 1983 and 1986 these differences are significant with approximately a one-point difference between men and women. For example, in Wave 6 men, on average, scored 8.8 on the opportunity scale, whereas women scored 7.9. Generally, opportunity measures appear to be stable over time, but in the later waves they show some decline. Gender differences are consistent with the theory.

Table 3. Distribution of time-varying measures of the General Theory of Crime

			Wave 1 1976	Wave 2 1977	Wave 3 1978	Wave 4 1979	Wave 5 1980	Wave 6 1983	Wave 7 1986
Opportunity	**Men**	**Mean (*sd*)**	8.9 (4.9)	8.9 (5.1)	8.8 (5.3)	8.8 (5.4)	9.1 (5.6)	8.8 (5.7)	7.4 (5.6)
		Missing % (*n*)	0.4 (4)	4.5 (41)	6.2 (57)	12.5 (115)	14.7 (135)	16.2 (149)	24.9 (229)
	Women	**Mean (*sd*)**	8.8 (4.4)	8.7 (4.6)	8.6 (4.9)	9.0 (4.9)	9.1 (5.3)	7.9 (5.6)	6.7 (5.2)
		Missing % (*n*)	0.6 (5)	4.1 (33)	5.7 (46)	8.6 (69)	11.9 (96)	10.3 (83)	17.5 (141)
		***t* (*df*)**	0.8 (1712)	0.7 (1648)	0.7 (1617)	-0.8 (1538)	0.1 (1489)	3.1** (1489)	2.5* (1351)

Note. sd=standard deviation; *df* = degrees of freedom.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Bivariate relationships[51]

A bivariate analysis shows that, as hypothesized, self-control and opportunity for criminal behaviour are associated with serious criminal behaviour (see Table 4, which presents the incidence-rate ratios (IRR) from the random-effects negative binomial regression models

[51] Bivariate analyses were conducted only for the whole group rather than split by gender for the following reasons: 1) bivariate relationship may no longer exist in the multivariate context, and 2) by conducting the bivariate analyses split by gender implicitly assumes a difference in the criminogenic factors for men and women; however, this is focus of the current study and is examined in the multivariate context.

(see page 74 for a reminder on the interpretation of IRRs). For example, each unit increase in self-control (i.e., as self-control becomes lower) results in a 28% increase in the likelihood of reporting of serious criminal behaviours. Across all waves of the survey, those with the lowest level of self-control are almost 32 times more likely (that is, $1.28^{14} = 31.6$) than those with the highest levels of self-control to report serious criminal behaviour. As expected by the theory, each increase in opportunity is associated with increases of 5% in the likelihood of serious criminal behaviour. Both gender and parental attachment are negatively related to serious criminal behaviour as proposed by the General Theory of Crime. Women are 73% less likely than men to report serious criminal behaviours over the life course. Every increase in parental attachment lowers the occurrence of criminal behaviour by a factor of 0.91. Finally, age has a curvilinear relationship with serious criminal behaviour, suggesting that initially as people age serious criminal behaviour increases; however, after age 13 there is a gradual decline in the probability of criminal behaviour. In all of the bivariate relationships the chi-square value of the random intercept (also presented in Table 4) is highly significant, and this suggests considerable variance left unaccounted. The introduction of self-control, however, has a dramatic effect on the chi-square value of the random intercept, suggesting that this factor accounts for a substantial portion of the unobserved heterogeneity in serious criminal behaviour.

It is important to note that neither cohort nor ethnicity is significantly related to serious criminal behaviour, although ethnicity is close to being significant ($p < 0.1$). The lack of relationship between these variables and criminal behaviour will have an impact on the multivariate models. For example, cohort is not included in further analyses because of issues with multicollinearity between cohort and age. Cohort was initially included to account for possible issues with left censoring, which does not appear to be an issue given that there is not a significant difference in the serious criminal behaviour reported by the two cohorts. The lack of significance of ethnicity and the consideration of its possible removal from further modelling, however, presents a challenge because of the well-established relationship between ethnicity and criminal behaviour. It is my intention to include ethnicity in multivariate models when its inclusion does not considerably deteriorate the fit of models.

Table 4. Bivariate relationships between self-reported serious criminal behaviour and the measures of the General Theory of Crime

	IRR	Random Intercept (χ^2)	Number of Observations	LL(*df*)	BIC
Age	1.30***	1679***	10908	-6070 (5)	12187
Age^2	0.99***				
Cohort	0.95	1582***	10908	-6192 (4)	12421
Ethnicity	1.19	1563***	10908	-6190 (4)	12418
Gender	0.27***	1244***	10908	-6085 (4)	12208
Self-control	1.28***	889***	10908	-6021 (4)	12080
Opportunity for criminal behaviour	1.05***	1559***	10857	-6040 (4)	12118
Parental attachment	0.91***	1567***	10835	-6059 (4)	12156

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Multivariate relationships

In the multivariate analysis, again, all the factors highlighted by the General Theory of Crime and the demographic controls are associated with serious criminal behaviour over the life-course in the expected directions (see Table 5, GTC Model). Parental attachment remains significant even with low self-control in the model. Increases in parental attachment are related to 5% decreases in the likelihood of serious criminal behaviour. This finding is contrary to the argument that low self-control and opportunity to commit criminal behaviour are the sole explanatory variables of criminal behaviour. Over the life course, each unit increase in self-control corresponds to increases of 28% in the likelihood of criminal behaviour. Those with the lowest levels of self-control are almost 32 times more likely than those with the highest level of self-control to report serious criminal behaviour. An increase in the opportunity to commit criminal behaviour translates to a 3% increase in the likelihood of self-reported serious criminal behaviour.

Demographic variables also account for variations in serious criminal behaviour. Only age^2 is significantly negatively related to the reporting of serious criminal behaviour; each unit increase corresponds to a 0.5% decrease in the likelihood of criminal behaviours. Visible minorities are 37% more likely than Caucasians and women are 66% less likely than men to report serious criminal behaviour.

Table 5. Multivariate relationships between self-reported serious criminal behaviour and the measures of the General Theory of Crime

	Model: No Interactions IRR	Model: Interactions IRR	Model: Gender Interactions IRR
Age	1.07	1.06	1.06
Age^2	0.995**	0.995**	0.995**
Ethnicity	1.37***	1.37***	1.37***
Gender	0.34***	0.34***	0.90
Parental attachment	0.95***	0.95***	0.97*
Self-control	1.28***	1.33***	1.33***
Opportunity for criminal behaviour	1.03***	1.06***	1.05***
Interaction: Self-control and opportunity for criminal behaviour		0.996**	0.996***
Interaction: Gender and parental attachment			0.95*
Interaction: Gender and self-control			0.99
Interaction: Gender and opportunity			1.01
Interaction: Gender and opportunity, and self-control			1.00
n	10790	10790	10790
LL (*df*)	-5576(10)	-5571(11)	-5566 (15)
BIC	11245	11244	11272
χ^2 -Random Intercept	624***	628***	631***

Note. IRR = Incidence-rate ratio; GTC = General Theory of Crime; n= number of observations included in the model; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 5 also contains two more models that examine the hypothesized effects of several interactions. As hypothesized, the interaction between self-control and opportunity is significant. Additionally, gender interactions were examined. The model shows that none of the gender interactions with self-control, opportunity, and self-control and opportunity is significant, and that their inclusion only worsened the model Bayesian Information Criterion (BIC). Thus, the final model includes only the significant interaction between parental attachment and gender suggesting that there may be differences in how the General Theory of Crime accounts for the criminal behaviour of men and women. It also provides support for modelling behaviour separately by gender.

In examining the model fit, the decrease in the BIC of the multivariate model from the bivariate models suggests that the multivariate model is superior (BIC for GTC model: 11,244 vs. BIC for bivariate models: 12,080 to 12,420). Further examination of the model fit information (that is, the chi-square values associated with random intercepts), however, reveals a significant amount of variation that is still unexplained, although the chi-square values are greatly reduced, by about 50%, from the bivariate models. The

variance of the random intercept is significant, suggesting that additional variables are needed to explain serious criminal behaviour.

There are minimal differences in the effects of theoretical variables in the models for each gender, as indicate by the lack of significant interactions with gender, with the exception of gender and parental attachment. Nevertheless, there are some differences in the explanatory power of the demographic variables between the two groups. The variables age and age^2 are significant in predicting serious criminal behaviour only in the case of men, whereas age is significant only for women (see Table 6). The age-crime relationship among women is linear and negative. With each unit increase in age there is a 25% decrease in the likelihood of criminal behaviour; whereas the relationship among men is curvilinear and eventually decreases over time. An examination of the simple relationship between age, age^2 and serious criminal behaviour for men shows that their behaviour peaks at age 15 when no other factors are considered. Ethnicity is significant only for women, as visible minority women are 85% more likely than Caucasian women to report criminal behaviour. Although there are minimal gender differences in the effect of parental attachment, low self-control and opportunity to commit criminal behaviour, the interaction between low self-control and opportunity to commit criminal behaviour is significant among men. In fact, the model BIC for women is better when this interaction is excluded from the model (3,070 vs. 3,078) and no change to the effects of other variables result when it is removed. Among men, contrary to the hypotheses put forward in the GTC, the interaction between self-control and opportunity for criminal behaviour shows that those with the lowest self-control and highest opportunity are 59% less likely (that is, $0.996^{225} = 0.41$; 1-0.41=59%) than those with the highest self-control and the least opportunity to commit serious criminal behaviour. According to GTC, one would expect that those with the lowest self-control and highest opportunity would report more criminal behaviour than those with higher self-control and less opportunity. The main effects, however, remain in the expected directions, with magnitudes similar to those in Table 5, regardless of the presence of this interaction. These differences should be interpreted with caution, however, as they are not associated with gender interactions.

Large differences in the fit statistics for the men's and women's models (Men's BIC: 8,169 vs. Women's BIC: 3,078) suggest that the General Theory of Crime Model

explains the criminal behaviour of women better than that of men. This finding, however, may reflect the lower variation associated with the serious criminal behaviour of women, besides the differences in sample size. In both models, the significant chi-square value of the random intercept points to the relevance of factors other than those incorporated in the General Theory of Crime.

Table 6. Multivariate relationships between self-reported serious criminal behaviour and the measures of the General Theory of Crime by gender

	Women IRR	Men IRR
Age	0.75*	1.21**
Age^2	1.00	0.99***
Ethnicity	1.85***	1.19
Self-control	1.35***	1.31***
Opportunity for criminal behaviour	1.07***	1.05*
Parental attachment	0.92***	0.96*
Interaction: Self-control and opportunity for criminal behaviour	1.00	0.996**
n	5138	5652
LL (*df*)	-1496 (10)	-4041 (10)
BIC	3078	8169
χ^2 -Random Intercept	207***	437***

Note. IRR = Incidence-rate ratio; GTC = General Theory of Crime; n= number of observations included in the model; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Summary of the relationships between the General Theory of Crime measures and serious criminal behaviour

Overall, the relationships between measures derived from the General Theory of Crime and serious criminal behaviour are significant and in most cases as hypothesized. Both low self-control and opportunity are associated with criminal behaviour, as well as an interaction between these two variables, although only for men. In contrast, against hypotheses stemming from General Theory of Crime, parental attachment and gender are associated with decreases in serious criminal behaviour over the life-course, while controlling for self-control and opportunity. Contrary to the overall hypothesis, there are differences in how the General Theory of Crime accounts for the criminal behaviour of men and women, and the effects of each of the measures are larger for women.

Finally, the General Theory of Crime Model accounts for a significant amount of variation in serious criminal behaviour over the life-course. The significance of the chi-square value of the random intercept suggests that additional variables, however, may help explain serious criminal behaviour over the life-course for both men and women.

Given the deviations from many of the propositions of the General Theory of Crime, the findings of the current study indicate weak support of the theory.

Life-course Theories: b) Interactional Theory

Univariate distributions

The Interactional Theory argues that several variables account for criminal behaviour over the life course: conventional beliefs, commitment to school, parental attachment, commitment to conventional activities, delinquent peers, marriage, and the presence of children. In the initial conceptualizations of the theory, Thornberry did not propose any interactions, although some have since been put forward. For example, gender interactions with parental attachment (Jang and Smith 1997), marriage and the presence of children (Giordano et al. 2002) have been suggested. Although a predominantly dynamic theory, it was not possible to include all variables as time-varying measures. Some measures are time invariant only, including conventional beliefs in the importance of both employment and school attendance, and commitment to school.

Most individuals highly endorse the conventional belief in the importance of work, although its possible range is from 1 to 5. Women have a slightly lower endorsement of conventional beliefs in work compared to men (4.8 vs. 4.9, t=3.2 $p < 0.01$) (see Table 7). There are no gender differences in conventional beliefs in the importance of school or commitment to school. The mean level of endorsement in the importance of school is 3.9, with scores that range from 1 to 5. Compared with belief in the importance of work, there is more variation in the endorsement of conventional beliefs in the importance of school. The mean commitment to school is about 11 and it ranges from 5 to 24, with lower values indicating more commitment. With regard to social class, there are no gender differences: 81% of respondents' parents did not report the use of public assistance in the last year (i.e., higher social class) and 19% of the parents reported receiving public assistance in the last year (i.e., lower social class).

Table 7. Distribution of time-invariant measures of the Interactional Theory

	Women		Men		
	Mean (*sd*)	**% Missing (*n*)**	**Mean (*sd*)**	**% Missing (*n*)**	**t-test (*df*)**
Conventional beliefs – Importance of work	4.8 (0.7)	0.5 (4)	4.9 (0.5)	0.3 (3)	$t_{(1466)}$= 3.2**
Conventional beliefs – Importance of school	3.93 (1.5)	0.5 (4)	3.9 (1.4)	0.7 (6)	$t_{(1713)}$= -0.3
Commitment to school	11.06 (3.1)	1.6 (13)	11.2 (2.8)	1.6 (15)	$t_{(1599)}$= 1.1

Note. sd=standard deviation; *df* = degrees of freedom.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Across the majority of waves, gender differences in the time-varying measures of Interactional Theory are apparent (see Table 8). Women consistently report higher objective parental attachment than men, although this difference is not significant in Wave 3. Possible scores range from 0 to 25 and actual average scores for men and women ranged respectively from 6.0 to 9.3 and 6.6 to 9.8. Parental attachment decreased over time, with scores declining by approximately 3 points over the ten-year period.

Attachment to delinquent peers also differed by gender. There is a general decline in the percentage of men and women reporting having few or some delinquent peers over time. The percentage of women reporting no delinquent friends is higher than that reported by men. The percentage of men and women with no delinquent peers ranged respectively from 29.0 to 45.0 and 39.3 to 52.1 over time. The men and women reporting few delinquent friends decreased over time, although the decline is larger for men (Men: 26.1% to 43.6%; Women: 37.9% to 42.2%). The percentage of men and women reporting some attachment to delinquent peers is slightly curvilinear over time, which increases and then decreases. Reporting an attachment to some delinquent friends is greater among men, and by the final wave is actually double that reported by women.

Table 8. Distribution of time-varying measures of the Interactional Theory

			Wave 1 1976	Wave 2 1977	Wave 3 1978	Wave 4 1979	Wave 5 1980	Wave 6 1983	Wave 7 1986
Parental attachment	**Men**	**Mean (*sd*)**	9.3 (3.4)	8.8 (3.5)	8.6 (3.7)	8.2 (3.7)	7.7 (3.8)	6.3 (4.0)	6.0 (4.1)
		% Missing (*n*)	0.3 (3)	4.5 (41)	6.0 (55)	17.4 (160)	23.9 (219)	35.5 (326)	58.6 (538)
	Women	**Mean (*sd*)**	9.8 (3.4)	9.3 (3.6)	8.9 (3.8)	8.8 (3.6)	8.3 (3.7)	7.5 (4.1)	6.6 (4.2)
		% Missing (*n*)	0.4 (3)	4.3 (35)	5.6 (45)	21.1 (170)	30.1 (243)	47.1 (380)	64.9 (524)
		t (*df*)	-3.4** (1717)	-2.4* (1612)	-1.8 (1587)	-3.2** (1393)	-3.0** (1215)	-4.5*** (900)	-2.0* (594)
Attachment to delinquent peers	**Men**	**None-%(*n*)**	29.0 (262)	30.7 (266)	33.8 (287)	34.0 (272)	36.3 (283)	39.5 (301)	45.0 (310)
		Few-%(*n*)	43.6 (394)	38.8 (336)	34.8 (296)	31.5 (253)	33.6 (262)	35.8 (273)	26.1 (240)
		Some-%(*n*)	27.4 (247)	30.5 (264)	29.1 (267)	34.4 (275)	30.1 (235)	24.8 (189)	20.2 (139)
		Missing - *n*	12	52	68	118	138	155	229
	Women	**None-%(*n*)**	39.3 (311)	41.4 (318)	42.8 (324)	38.6 (283)	41.3 (292)	46.5 (335)	52.1 (354)
		Few-%(*n*)	42.2 (334)	39.8 (306)	37.0 (280)	39.2 (288)	38.1 (269)	37.9 (273)	37.9 (258)
		Some-%(*n*)	18.5 (146)	18.8 (144)	20.2 (153)	22.2 (163)	20.7 (146)	15.7 (113)	10.0 (68)
		Missing - *n*	16	39	50	73	100	86	127
		$X^2_{(2)}$	27.8***	35.6***	28.3***	28.3***	17.5***	19.8***	27.9***
Presence of children[a]	**Men**	**No - % (*n*)**	99.9 (701)	99.9 (701)	99.9 (701)	99.6 (699)	99.3 (697)	96.6 (678)	88.3 (82)
		Yes - % (*n*)	0.1 (1)	0.1 (1)	0.1 (1)	0.4 (3)	0.7 (5)	3.4 (24)	11.7 (82)
	Women	**No - % (*n*)**	99.9 (682)	99.6 (680)	99.1 (677)	98.7 (674)	98.0 (669)	90.8 (620)	79.5 (543)
		Yes- % (*n*)	0.1 (1)	0.4 (3)	0.9 (6)	1.3 (9)	2.0 (14)	9.2 (63)	20.5 (140)
		$X^2_{(1)}$	0.00	1.05	3.73	3.20	4.58*	19.8***	20.0***

			Wave 1 1976	Wave 2 1977	Wave 3 1978	Wave 4 1979	Wave 5 1980	Wave 6 1983	Wave 7 1986
Marriage	**Men**	**Yes - % (*n*)**	0.2 (2)	0.4 (4)	1.2 (11)	3.0 (26)	7.0 (59)	18.2 (146)	35.7 (250)
		Missing – *n*	0	15	29	61	80	114	216
	Women	**Yes - % (*n*)**	1.1 (9)	2.5 (20)	5.6 (44)	9.4 (72)	15.0 (114)	34.0 (253)	50.7 (346)
		Missing - *n*	0	14	24	38	47	62	124
		$X^2_{(2)}$	5.5*	13.1**	25.2***	31.7***	31.5***	61.1***	50.4***
Conventional activities	**Men**	**Neither-%(*n*)**	0.1 (1)	0 (0)	0.5 (4)	0.7 (6)	1.5 (12)	3.5 (27)	3.0 (21)
		School - %(*n*)	42.0 (384)	36.1 (317)	24.0 (207)	18.4 (148)	17.2 (135)	4.9 (38)	1.4 (10)
		Work - % (*n*)	1.0 (9)	2.0 (18)	5.1 (44)	13.8 (111)	20.1 (157)	51.8 (399)	64.1 (449)
		Both- % (*n*)	56.9 (521)	61.9 (544)	70.5 (608)	67.1 (540)	61.2 (479)	39.7 (306)	31.4 (220)
		Missing – *n*	3	39	55	113	135	148	218
	Women	**Neither-%(*n*)**	0.4 (3)	0.4 (3)	1.0 (8)	2.0 (15)	4.6 (33)	8.8 (64)	12.0 (82)
		School - %(*n*)	31.8 (256)	24.4 (189)	19.0 (145)	14.8 (109)	15.0 (107)	6.1 (44)	3.1 (21)
		Work - % (*n*)	0.4 (3)	2.1 (16)	5.8 (44)	11.7 (86)	17.7 (126)	45.7 (332)	60.5 (413)
		Both- % (*n*)	67.4 (542)	73.2 (568)	74.2 (566)	71.5 (528)	62.6 (445)	39.4 (286)	24.5 (167)
		Missing – *n*	3	31	44	69	96	81	124
		$X^2_{(3)}$	22.9***	29.7***	7.6***	10.2*	14.3**	21.0***	48.6***

Note. sd=standard deviation; *df* = degrees of freedom.

[a]124 women and 216 men did not have information about children in Wave 7, which is where the information was collected.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

The presence of children substantially increases over time; however, it increases more among women than men. The percentage of women reporting children ranged from 0.1 to 20.5 compared to 0.1 to 11.7 for men. Gender differences in the presence of children only become significant during the final three waves of the survey. Marriage is also reported proportionally more over time and in every wave women are more likely to report marriage than men. The percentage of men and women reporting marriage ranged respectively from 0.2 to 35.7 and 1.1 to 50.7.

The breakdown of conventional activities changes as respondents age, and there are significant differences in the reporting of these activities by gender. Very few men and women report engaging in neither school nor work, although this percentage

generally increased over time, and women tended to report this more often than men. The percentage of men and women reporting a lack of these conventional activities ranged respectively from 0.0 to 3.5 and 0.4 to 12.0. The percentage of men and women who were engaging in school steadily decreased over time, respectively ranging from 1.4 to 42.0 and 3.1 to 31.8. The trend of engaging in work increases as the respondents aged. Similar percentages of men and women reported working, but not attending school, with a range from 1.0 to 64.1 and 0.4 and 60.5, respectively. The percentage of respondents engaging in both school and work is slightly curvilinear over time. The majority of men and women reported both working and going to school until Waves 6 and 7. The percentage of men and women reporting engaging in both of these conventional activities ranged respectively from 31.4 to 70.5 and 24.5 to 74.2.

Bivariate relationships

Bivariate analyses lend support to the majority of the hypotheses proposed under the Interactional Theory (see Table 9). Conventional beliefs in the importance of school, the presence of children, marriage and objective parental attachment (i.e., time-varying parental attachment measure) were all negatively related to serious criminal behaviour. As the belief in the importance of school increases, there is a corresponding 18% decrease in the likelihood of criminal behaviour. Likewise, the presence of children and being married are respectively related to decreases of 56% and 61% in the likelihood of criminal behaviour. Increase in parental attachment is also related to a decrease of 2% in the likelihood of criminal behaviour.

With the exception of conventional beliefs in the importance of work, all of the remaining variables are significantly and positively associated with serious criminal behaviour. Respondents whose parents in the first wave reported being on public assistance were 80% more likely than those whose parents were not on public assistance to report criminal behaviour. As commitment to school decreases (represented by higher scores on the school commitment scale), there is a corresponding 10% increase in the likelihood of criminal behaviour. Those with the lowest commitment to school are over 2.5 times more likely than those with the highest levels of commitment to report the likelihood of criminal behaviour. Contrary to expectations, conventional activities were positively associated with the outcome. Compared to those who were neither studying nor

working, those who reported being in school were 52% more likely to report criminal behaviour. Similarly, those who were working and going to school were 59% more likely than those doing neither to report criminal behaviour. As expected, the presence of delinquent peers has a significant impact on criminal behaviour. Those reporting a few delinquent peers are 44% more likely than those reporting no delinquent peers to report criminal behaviour. Comparatively, those with some delinquent peers are 4 times more likely than those without delinquent peers to report criminal behaviour.

The BICs for the bivariate models are similar to those seen for the variables of the General Theory of Crime; comparatively, the presence of children and time-varying parental attachment are associated with low BICS (10,430 and 10,902 vs. 11,896 to 12,339). These two bivariate BICs are lower than the BIC for the Full General Theory of Crime Model, though both are associated with lower numbers of observations. The chi-square value of the random intercepts are significantly higher in these bivariate models than in those for GTC, suggesting that the variables individually account for less of the unobserved heterogeneity associated with serious criminal behaviour than the Full General Theory of Crime Model.

Table 9. Bivariate relationships between self-reported serious criminal behaviour and the measures of Interactional Theory

	IRR	Random Intercepts (χ^2)	Number of Observations	LL(*df*)	BIC
Presence of children	0.44***	1408***	9466	-5197 (4)	10430
Parental attachment	0.98***	1263***	9320	-5433 (4)	10902
Presence of delinquent peers					
Few vs. none	1.44***	1043***	10795	-5806 (5)	11657
Some vs. none	3.99***				
Commitment to school	1.10***	1512***	10473	-5949 (4)	11936
Social class	1.80***	1491***	10713	-6056 (4)	12149
Conventional beliefs – Importance of school	0.82***	1573***	10846	-6069 (4)	12174
Conventional beliefs – Importance of work	1.05	1628***	10863	-6101 (4)	12239
Conventional activities					
School Only vs. neither	1.52*				
Work Only vs. neither	0.93	1701***	10902	-6078 (6)	12212
Both vs. neither	1.59**				
Marriage	0.39***	1602***	10907	-6139 (4)	12315

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Multivariate relationships

In the multivariate model without interactions, the observed effects generally support the hypotheses proposed in the Interactional Theory (see Table 10). Notably marriage, conventional activities, and conventional beliefs in the importance of work are not in the final model because their inclusion does not decrease the model BIC. In terms of the demographic variables, age^2, ethnicity and gender are all associated with serious criminal behaviour. Women are 68% less likely than men and visible minorities are 34% more likely than Caucasian respondents to report criminal behaviour.

Table 10. Multivariate relationships between self-reported serious criminal behaviour and the measures of Interactional Theory

	Model[a]: No Interactions IRR	**Model[b]: Gender Interactions** IRR
Age	1.06	1.07
Age^2	0.995**	0.995*
Ethnicity	1.34**	1.33**
Gender	0.32***	0.29***
Presence of delinquent peers		
Few vs. none	1.55***	1.55***
Some vs. none	3.68***	3.69***
Commitment to school	1.04**	1.04**
Social class	1.52***	1.52***
Conventional beliefs – Importance of school	0.85***	0.85**
Marriage	-	0.64
Parental attachment	0.96***	0.96***
Presence of children	1.94*	2.71
Interaction: Gender and parental attachment	-	1.01
Interaction: Gender and marriage	-	1.53
Interaction: Gender and children	-	0.68
n	7687	7686
LL (*df*)	-3974(14)	-3973 (18)
BIC	8072	8107
χ^2 -Random Intercept	437***	435***

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

[a] Simultaneous Entry model's BIC is 8,233.

[b] Simultaneous Entry model's BIC is 8,029.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Parental attachment and conventional beliefs in the importance of school reduce the likelihood of criminal behaviour. Increases in parental attachment and conventional beliefs in school are respectively related to a 4% and 15% decrease in the likelihood of criminal behaviour. The remainder of the Interactional Theory measures increase the likelihood of criminal behaviour. As commitment to school decreases, there is a 4%

increase in the likelihood of criminal behaviour. The effect of social class declines slightly in this model, compared to the effect in the bivariate model. Respondents whose parents reported being on public assistance are 52% more likely than those whose parents were not on public assistance to report criminal behaviour. The presence of delinquent peers remains significant; however, its effect is less in the multivariate model. Similar to the bivariate model, those with a few delinquent peers and those with some delinquent peers are respectively 1.5 and 3.7 times more likely than those with no delinquent peers to report criminal behaviour. The effect of the presence of children has greatly changed from the bivariate to the multivariate models, which is likely due to its close relationship with age (i.e., people are more likely to have children as well as to quit engaging in criminal behaviour as they age). Contrary to these expectations, those who have children are twice as likely as those without children to report criminal behaviour.

Only a few interactions with gender have been proposed and are examined in the multivariate model (see Table 10). Contrary to expectations, none of the interactions are significant. Thus, there is no statistical evidence to support modelling the Interactional Theory separately by gender.

Summary of the relationships between the measures of the Interactional Theory and serious criminal behaviour

Overall, the tenets of the Interactional Theory are weakly supported by the findings. Not all of the hypothesized relationships proposed in the Interactional Theory are significant or in expected directions. As anticipated, parental attachment and conventional belief in the importance of school are related to decreases in criminal behaviour. Both the presence of delinquent friends, less commitment to school and lower social class are related to increases in the likelihood of serious criminal behaviour, as hypothesized. Contrary to the hypotheses, conventional activities, marriage and conventional beliefs in the importance of work do not significantly contribute to explaining the variance of serious criminal behaviour over the life-course. Furthermore, the relationship with presence of children is contrary to expectations. Although not proposed in the original theory, none of the hypothesized interactions with gender is significant. Taken as a whole, the lack of significance of several measures of the Interactional Theory and the unexpected

relationships regarding the presence of children provide only a weak support of the Interactional Theory in explaining serious criminal behaviour.

When examining the model fit, the Interactional Theory Model's BIC is better than that of the General Theory of Crime Model, suggesting that this collection of measures better accounts for the variation in serious criminal behaviour. Nevertheless, unlike in the case of the General Theory of Crime Model, there is no evidence that gender-specific models are beneficial in explaining serious criminal behaviour.

Life-course Theories: c) Dual Taxonomy

Univariate distributions

The Dual Taxonomy theory, as proposed by Moffitt, combines both static and dynamic concepts in the explanation of criminal behaviour. The static features include neuropsychological deficits and family adversity that are measured by grade failure, parental disciplinary style and deviance. The dynamic features of this theory are desire for autonomy, peer rejection and knowledge of delinquent peers, however, it was only possible to operationalize the concepts of peer rejection and knowledge of delinquent peers when using the NYS. The desire for autonomy is often an untested component of this theory because many studies do not collect this information.

As proposed by Moffitt, only a small percentage of respondents show signs of neuropsychological deficits, as measured through grade failure (see Table 11). About 5% of respondents report having failed a grade by the first wave of the survey and although gender differences are approaching significant, they are not significant, which is contrary to hypotheses that men are more likely than girls to have neuropsychological deficits. The majority of respondents (59% to 60%) have parents who used an inductive method of discipline (preferred method). Approximately one-third of respondents' parents used semi-inductive methods (30%) and the remainder of parents used non-inductive measures (12%). No gender differences in the disciplinary style of parents are noted.

Finally, the average score on the parental deviance scale is 2.3. On average, parents endorse adult criminal behaviour as being a little bit wrong. Actual scores range from zero to 19, and no gender differences are present for this measure. The static features of the Dual Taxonomy theory are expected to predict serious criminal behaviour and these measures should have a much larger effect in explaining serious criminal

behaviour than non-serious criminal behaviour. Although direct comparisons of the modelling cannot be made at this time, they will be made subsequently in the section examining non-serious criminal behaviour.

Table 11. Distribution of time-invariant measures of the Dual Taxonomy

	Women **% (*n*)**	**Men** **% (*n*)**	**$\chi 2$ (*df*) or t-test (*df*)**
Neuropsychological deficits			
Age appropriate grade	95.7 (758)	93.7 (848)	3.4 (1)
Grade failure	4.3 (34)	6.3 (57)	
Missing (*n*)	15	13	
Parental discipline style			
Inductive	59.6 (465)	56.7 (510)	
Semi-inductive	29.2 (228)	30.3 (273)	2.0 (2)
Non-inductive	11.2 (87)	13.0 (117)	
Missing (*n*)	27	18	
	Mean (*sd*)	**Mean (*sd*)**	
Parental deviance	2.4 (3.0)	2.2 (3.0)	$t_{(1665)}$= -1.3
Missing % (*n*)	4.5 (36)	2.4 (22)	

Note. sd=standard deviation; *df* = degrees of freedom.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Peer rejection and knowledge of delinquent peers is the only time-varying concept proposed in the Dual Taxonomy. Overall, the percentage of men and women reporting delinquent peers decreases over time, those reporting non-delinquent peers stay relatively stable over time, and those reporting no peers increases over time (see Table 12). Significant gender differences are observed. Women are significantly more likely to report having non-delinquent peers, and less likely to have delinquent peers at all ages when compared to men. Over time, 15.9 to 29.2% of men and 10.8 to 28.8% of women report having no peers. The increase in the percentage of women reporting not having any delinquent peers is more pronounced than the increase experienced by men. For example, the percentage of men reporting non-delinquent peers only ranged from 10.3 to 15.0, whereas for women the range is from 20.0 to 27.1. This change in the reporting of no peers is related to changes in non-delinquent peers reported by women and delinquent peers reported by men. The percentage of men and women reporting delinquent friends ranged from 55.8 to 73.8 and 48.2 to 62.8 over time.

Table 12. Distribution of time-varying independent measures of Dual Taxonomy

			Wave 1 1976	Wave 2 1977	Wave 3 1978	Wave 4 1979	Wave 5 1980	Wave 6 1983	Wave 7 1986
Peer rejection and knowledge of delinquent Peers	Men	**No peers - % (*n*)**	15.9 (143)	17.1 (147)	20.2 (171)	21.1 (168)	21.5 (167)	23.9 (182)	29.2 (200)
		No delinquent peers- % (*n*)	10.3 (93)	11.8 (102)	11.4 (96)	11.3 (90)	13.1 (102)	14.4 (110)	15.0 (103)
		Delinquent peers - % (*n*)	73.8 (665)	71.1 (613)	68.4 (578)	67.7 (540)	65.4 (508)	61.7 (470)	55.8 (383)
		Missing - (*n*)	17	56	73	120	141	156	232
	Women	**No peers - % (*n*)**	10.8 (85)	12.5 (96)	16.0 (121)	15.5 (114)	18.4 (130)	26.3 (189)	28.8 (196)
		No delinquent peers- % (*n*)	26.4 (208)	27.1 (208)	24.3 (184)	21.8 (160)	21.9 (155)	20.0 (144)	22.9 (156)
		Delinquent peers - % (*n*)	62.8 (495)	60.4 (463)	59.7 (452)	62.7 (460)	59.7 (422)	53.8 (387)	48.2 (328)
		Missing- (*n*)	19	40	50	73	100	87	127
		$X^2_{(df=2)}$	76.4***	62.5***	46.9***	33.7***	20.2***	11.5**	15.1**

Note. sd=standard deviation; *df* = degrees of freedom; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Bivariate relationships

An examination of bivariate relationships reveals that the majority of variables proposed in the Dual Taxonomy theory are associated with serious criminal behaviour (see Table 13). The variable measuring disciplinary style of parent is included as a way to measure family adversity but is not associated with serious criminal behaviour. Additionally, the interaction between disciplinary style and neuropsychological deficits is examined and is not associated with criminal behaviour. As seen in Table 13, those with neuropsychological deficits, as measured by grade failure, are 52% more likely than those without deficits to report serious criminal behaviour. Parental deviance also predicts increases in the likelihood of serious criminal behaviour, increases in parental deviance correspond to an 8% increase in the likelihood of serious criminal behaviour.

The bivariate relationship between criminal behaviour and peer rejection and knowledge of delinquent peers provides mixed support for some of the hypotheses proposed in the Dual Taxonomy. As previously noted, Moffitt theorizes differently regarding the role of peers and more specifically delinquent peers in the development criminal behaviours than other life-course theories. Moffitt highlights the importance of not having peers (i.e., peer rejection) and having delinquent peers as opposed to non-delinquent peers; other life course theories do not consider peer rejection but rather focus

on the gradation of delinquency among peers. These differences required a slightly different categorization of the delinquent peer variable that is used in the Interactional Theory and Age-graded Theory of Informal Social Control (no peers, non-delinquent peers, and delinquent peers vs. non-delinquent peers, few delinquent peers and some delinquent peers). The respondents reporting non-delinquent peers are 83% less likely than those with delinquent peers to report serious criminal behaviours. This relationship may change in the multivariate model since neuropsychological deficits and parental deviance should account for the majority of the variation in serious criminal behaviour, as proposed in the theory. The present bivariate relationship examining the effect of having no peers versus having delinquent peers shows that those individuals with no peers were only 44% less likely than those with delinquent peers to engage in criminal behaviours. Contrary to the hypothesized non-delinquency of this group, however, the protective effect of having no peers is actually less than that of having peers who are non-delinquent. It may be that those who are reporting no peers are more representative of low-level chronic offenders rather than non-delinquents as later proposed by Moffitt.

Table 13. Bivariate relationships between self-reported serious criminal behaviour and the measures of Dual Taxonomy Theory

	IRR	Random Intercept (χ^2)	Number of Observations	LL(*df*)	BIC
Peer rejection and knowledge of delinquent peers					
No peers vs. delinquent peers	0.56***				
Non-delinquent peers vs. delinquent peers	0.17***	1323	10795	-5919 (5)	11885
Parental deviance	1.08***	1458	10602	-5969 (4)	11975
Neuropsychological deficits	1.52*	1505	10741	-6043 (4)	12124
Parenting style					
Non-inductive vs. inductive	1.28	1543	10697	-6064 (5)	12175
Semi-inductive vs. inductive	1.00				

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The BICs of the bivariate models range from 11,885 to 12,175. This indicator of model fit is within the range of those for previous models; still, this group of variables tends to provide slightly smaller BICs than those of the General Theory of Crime model, and BICs higher than those associated with the Interactional Theory Model. The chi-

square values of random intercepts range from 1,323 to 1,543. Again, this range is similar to those observed for the previous models; however, the BIC of the bivariate relationship between self-control and serious criminal behaviour remains by far the greatest single reduction in the chi-square value of the random intercept.

Multivariate relationships

An examination of multivariate relationships reveals that many of the hypotheses concerning the Dual Taxonomy concepts are supported (see Table 14). Focussing on the main effects model, all demographic variables are significantly associated with the likelihood of serious criminal behaviour. There is a curvilinear relationship between age and serious criminal behaviour. Visible minorities are 28% more likely than Caucasians and women are 71% less likely than men to report serious criminal behaviours.

Table 14. Multivariate relationships between self-reported serious criminal behaviour and the measures of Dual Taxonomy (DT)

	Model: No Interactions[a] IRR	Model: Interactions[b] IRR	Model:Gender Interactions[c] IRR
Age	1.27***	1.27***	1.27***
Age^2	0.991***	0.991***	0.991***
Ethnicity	1.28**	1.28*	1.29*
Gender	0.29***	0.29***	0.31***
Parental deviance	1.08***	1.08***	1.08***
Neuropsychological deficits	1.59**	1.30	1.58**
Peer rejection and knowledge of delinquent peers			
No peers vs. delinquent peers	0.62***	0.62**	0.68***
Non-delinquent peers vs. delinquent peers	0.19***	0.19***	0.21***
Interaction: Neuropsychological deficits and parental deviance		1.07	-
Interaction: Gender and knowledge of delinquent peers			0.79*
n	10341	10341	10341
LL (*df*)	-5372 (11)	-5372 (12)	-5369 (12)
BIC	10846	10854	10848
χ^2 -Random Intercept	985***	976***	989***

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. [a]Simultaneous entry models has a BIC of 10,854. [b]The simultaneous entry model has a BIC of 10,872. [c]The simultaneous entry model has a BIC of 10,857.

As hypothesized, individual neuropsychological deficits and parental deviance are related to increases in criminal behaviour. Those with neuropsychological deficits are 59% more likely than those without to report criminal behaviours. Likewise, increases in

the deviance of parents are related to an 8% increases in the likelihood of reporting of criminal behaviours over the life course of their children. Contrary to hypotheses, the interaction between these two measures is not significant. The presence of these two deficits does not have a combined effect, as suggested by Dual Taxonomy. The variable peer rejection and knowledge of delinquent peers has similar effects in the multivariate model as it does in the bivariate models. Compared to those with delinquent peers, those without are 38% less likely to report serious criminal behaviour. This effect is greater when comparing respondents with non-delinquent peers and respondents with delinquent peers. Respondents with non-delinquent peers are 81% less likely than those with delinquent peers to report serious criminal behaviour. As previously mentioned, Moffitt did not propose this effect for serious criminal behaviour; nevertheless, this may provide evidence in support of low-level chronics as later discussed by Moffitt (2006).

An examination of the BIC of the multivariate model suggests some improvement over the bivariate models (10,846 vs. 11,885 to 12,175), indicating an improved predictive ability of the multivariate model. The BIC of the Dual Taxonomy multivariate model is better than that of the BIC for the multivariate General Theory of Crime model (10,846 vs. 11,244); however, it is not as low as the BIC for the multivariate model of the Interaction Theory (8,072). The chi-square value of the random intercept of the multivariate model is also smaller than those of the bivariate models (985 vs. 1,323 to 1,543), suggesting an improvement in the ability of the multivariate model to account for unobserved heterogeneity in the model compared to the bivariate models. The chi-square values of the random intercepts of these models are similar to those observed in the Interactional Theory and the General Theory of Crime Models. All of the models indicate that a significant variation in unobserved heterogeneity remains unexplained.

One interaction with gender - gender and peer rejection and knowledge of delinquent peers is significant (see Table 14). The significance of this interaction suggests that the effect of peer rejection and knowledge of delinquent peers is different for women and men. This finding lends support to Moffitt's proposition that women would be less likely than men to have delinquent peers and because of this would be less likely to engage in criminal behaviour. Overall, in the split models (see Table 15), the gender differences in the magnitude of this effect is not dramatic when examined separately for

men and women. The effect of having no peers is larger for women than for men; men and women with no peers are respectively 34% vs. 53% less likely than those with delinquent peers to report serious criminal behaviour. Men and women with non-delinquent peers are 79% and 84% less likely than those with delinquent peers to report criminal behaviour.

Although not associated with significant interactions with gender, and therefore should be considered with caution, the effects of some measures were different for men and women. Age and age^2 are significant among men only, and their relationship with the likelihood of serious criminal behaviour is curvilinear. Among women only, visible minorities are 56% more likely than Caucasians to report criminal behaviours. There is a significant and relatively large association between neuropsychological deficits and criminal behaviour for men only. Men with neuropsychological deficits are 68% more likely than those without these deficits to report serious criminal behaviour. This contradicts the hypothesis that neuropsychological deficits will also predict the serious criminal behaviour (i.e., life-course-persistent offending) of women as well as men.

Table 15. Multivariate relationships between self-reported serious criminal behaviour and the measures of Dual Taxonomy by gender

	Women IRR	Men IRR
Age	0.92	1.44***
Age^2	1.00	0.99***
Ethnicity	1.56*	1.14
Parental deviance	1.12***	1.05**
Neuropsychological deficits	1.48	1.68**
Knowledge of Delinquent peers		
No peers vs. delinquent peers	0.47***	0.66***
Non-delinquent peers vs. delinquent peers	0.16***	0.21***
n	4881	5460
LL (*df*)	-1429 (10)	-3918 (10)
BIC	2942	7922
χ^2 -Random Intercept	260***	710***

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Summary of the relationships between the Dual Taxonomy measures and serious criminal behaviour

The findings provide mixed support for the hypotheses of the Dual Taxonomy. Although the effects of neuropsychological deficits and parental deviance are as expected in the

multivariate models with all respondents, the remainder of findings are not strictly in line with the theory. First, parental disciplinary style is not associated with serious criminal behaviour as hypothesized. Secondly, the relationship between peer rejection and knowledge of delinquent peers appears to be more complex than proposed in the Dual Taxonomy theory. Respondents having no peers may actually be low-level chronic offenders rather than non-delinquents. Further examination of the relationship between this measure and non-serious criminal behaviour allows further conclusions regarding the impact of this measure on criminal behaviour over the life-course.

Contrary to hypotheses, an interaction between neuropsychological deficits and parental deviance is not significant. The effects of parental deviance and peer rejection and knowledge of delinquent peers are slightly larger for men than for women, this effect alone, however, does not require gender-specific modelling.

Regardless of these issues, the model fit for the Dual Taxonomy is better than for the General Theory of Crime, but not for the Interactional Theory; however, this model has the least ability to account for unobserved heterogeneity in serious criminal behaviour. Taken as a whole, the present findings provide only a weak support for the hypotheses of the Dual Taxonomy theory.

Life-course Theories: c) Age-graded Theory of Informal Social Control

Univariate distributions

As proposed by Sampson and Laub (1993), the theory includes several static background factors, such as disruptions to two-parent households, social class, number of siblings, parental disciplinary style, parental rejection, and general deviance of parents. This theory also considers factors, such as early conduct disorder and difficult temperaments that are static. Several dynamic sources of formal and informal social control are included in this theory, such as parental attachment, involvement in school, presence of delinquent peers, incarceration, work and marriage.

There are few differences between men and women when examining the time-invariant factors included here (see Table 16). Overall, 59% of respondents' parents do not think it is very wrong to engage in at least one criminal behaviour. Only 2.3% of respondents agree with statements suggesting parental rejection. In total, 18.9% of respondents live in a one-parent household and 1.4% of respondents' parents reported

that their child had a difficult temperament (i.e., bad kid). Only two of the time-invariant measures vary by gender. Among men, 4.4% of respondents report engaging in criminal behaviour before the age of 11, whereas only 0.9% of women report criminal behaviour before this age, χ^2 (1, n=1385) = 16.7, $p < 0.001$. On average, boys reported having more siblings than girls do, although this difference is trivial (3.2 vs. 3.0, $t_{(1723)}$=-2.8, $p <$ 0.01). 81% of respondents' parents did not report the use of public assistance in the last year (i.e., higher social class) and 19% of the parents reported receiving public assistance in the last year (i.e., lower social class).

Table 16. Distribution of time-invariant measures of the Age-graded Theory of Informal Social Control

	Women % (*n*)	**Men % (*n*)**	**χ2 (*df*) or t-test (*df*)**
Parental deviance			
No	39.2 (302)	42.5 (381)	1.9 (1)
Yes	60.8 (469)	57.5 (515)	
Missing (*n*)	36	22	
Parental rejection			
No	97.4 (781)	97.9 (894)	0.54 (1)
Yes	2.6 (21)	2.1 (19)	
Missing (*n*)	5	5	
One parent household structure			
No	80.3 (627)	81.8 (738)	0.65 (1)
Yes	19.7 (154)	18.2 (164)	
Missing (*n*)	26	16	
Difficult temperament			
No	98.7 (770)	98.6 (889)	0.1 (1)
Yes	1.3 (10)	1.4 (13)	
Missing (*n*)	27	16	
Early conduct disorder			
No	99.1 (677)	95.6 (671)	16.7*** (1)
Yes	0.9 (6)	4.4 (31)	
Missing (*n*)	124	216	
	Mean (*sd*)	**Mean (*sd*)**	
Number of siblings	3.0 (1.7)	3.2 (1.9)	$t_{(1723)}$= -2.8**
Missing (*n*)	42	42	

Note. sd=standard deviation; *df* = degrees of freedom.
* $p < 0.05$; ** $p < 0.01$; *** $p <0.001$.

Several of the Age-graded Theory of Informal Social Control measures are time-varying (see Tables 17 and 18). From Wave 1 through to Wave 5, women report, on average, more school involvement than men. Men's involvement in school ranges from

2.8 to 8.2 and women's ranges from 2.4 to 9.3, with an approximate difference of 0.5 points on the scale between Waves 1 and 5. No differences are present in Waves 6 and 7, likely reflecting that fewer of the respondents are actually still in school. Overall, few respondents report incarceration; notwithstanding, men are significantly more likely than women to report incarceration in the later waves of the survey. Over time, the proportion of men and women reporting incarceration ranges respectively from 0 to 1% and 0 to 0.1%. Due to the extreme rarity of incarceration within this sample, it is unlikely that this measure can be maintained in multivariate modelling.

The effect of work is also examined within the context of informal social control. With the exceptions of Wave 4 and 5, there are significant differences in the percentage of men and women reporting work over time, and these percentages change over time. Women are more likely than men to report working from Wave 1 to 3. For example, for the first three waves the percentage of women working ranges from 67.8 to 79.9 compared to 57.9 to 75.6. Between Waves 1 and 5, the gender gap in work decreases; after Wave 5, however, this gap begins to increase with men now more likely to report working than women. For example, in Waves 6 and 7, 91.6% and 95.6% of men reported working compared to 85.1% and 84.9% of women.

The Age-graded Theory also notes the importance of delinquent peers and marriage in explaining criminal behaviour. These factors have been included in previously examined theories and will only be briefly touched upon here.[52] Overall, there are significant differences in the reporting of having delinquent peers by gender. Women are more likely to report no delinquent peers than men, whereas men consistently report having some delinquent peers more often than women. The presence of a few delinquent peers is much more stable for women compared to men. Over time, the proportion of men reporting having only a few delinquent peers grows. Marriage is also reported proportionally more over time, and is reported more among women in every wave compared to men. The percentages of men and women reporting marriage range respectively from 0.2 to 35.7 and 1.1 to 50.7.

[52] See Table 9 and the Univariate Distribution discussed under the Interactional Theory for more detailed discussion of these factors.

Table 17. Distribution of time-varying independent measures of Age-graded Theory of Informal Social Control

			Wave 1 1976	Wave 2 1977	Wave 3 1978	Wave 4 1979	Wave 5 1980	Wave 6 1983	Wave 7 1986
School involvement	Men	Mean (*sd*)	8.2	8.2	7.9	7.3	7.0	4.6	2.8
			(3.2)	(3.4)	(3.9)	(4.4)	(4.9)	(5.7)	(4.9)
		Missing - % (*n*)	0.4	4.4	6.2	12.4	15.0	16.4	30.2
			(4)	(40)	(57)	(114)	(138)	(151)	(277)
	Women	Mean (*sd*)	9.3	9.3	9.0	8.3	7.6	4.8	2.4
			(3.2)	(3.5)	(4.0)	(4.6)	(5.1)	(5.8)	(4.8)
		Missing- % (*n*)	0.6	4.0	5.6	8.6	11.9	10.2	21.6
			(5)	(32)	(45)	(69)	(96)	(82)	(174)
		t (*df*)	-7.0*	-6.6*	-5.4*	-4.3*	-2.4*	-0.7	1.3
			(1714)	(1607)	(1583)	(1521)	(1465)	(1482)	(1272)
Time incarcerated[a]	Men	No - % (*n*)	100	99.9	99.7	99.7	99.4	99.5	99.3
			(702)	(701)	(700)	(700)	(698)	(695)	(697)
		Yes - % (*n*)	0	0.1	0.3	0.3	0.6	1.0	0.7
			(0)	(1)	(7)	(7)	(4)	(7)	(5)
	Women	No - % (*n*)	100	100	99.9	100	100	100	100
			(683)	(683)	(682)	(683)	(683)	(683)	(683)
		Yes- % (*n*)	0	0	0.1	0	0	0	0
			(0)	(0)	(1)	(0)	(0)	(0)	(0)
		$X^2_{(1)}$	-	0.94	0.31	2.0	3.9*	6.9**	4.9*
Working	Men	No - % (*n*)	42.1	36.1	24.4	19.1	18.8	8.4	4.4
			(385)	(317)	(211)	(154)	(147)	(65)	(31)
		Yes - % (*n*)	57.9	63.9	75.6	80.9	81.2	91.6	95.6
			(530)	(562)	(652)	(651)	(636)	(705)	(669)
		Missing - *n*	3	39	55	113	135	148	218
	Women	No - % (*n*)	32.2	24.7	153	16.8	19.7	14.9	15.1
			(259)	(192)	(20.1)	(124)	(140)	(108)	(103)
		Yes- % (*n*)	67.8	75.3	79.9	83.2	80.3	85.1	84.9
			(545)	(584)	(610)	(614)	(571)	(618)	(580)
		Missing - *n*	3	31	44	69	96	81	124
		$X^2_{(1)}$	17.8***	24.8***	4.5*	1.4	0.2	15.1***	44.8***

Note. sd=standard deviation; *df* = degrees of freedom.

[a]This variable was created from information collected in the seventh wave of the survey, thus the number of missing is constant across all waves: Men -216 and Women-124.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Sampson and Laub (1993) proposed not only that work or marriage would constrain criminal behaviour, but rather that the informal social control stemming from these roles act as the constraint. Using the NYS, it is possible to examine work attachment from Wave 2 on and marital attachment from Wave 4 on (see Table 18).

For the majority of waves, gender differences exist in the percentage of men and women reporting work; however, no real difference exists in the percentage of men and

women reporting that their work is important to them (see Table 18). Overall, the percentage of men and women working increases over time. Women are more likely than men to report working in Waves 2 and 3, whereas men are more likely than women to report working in Waves 6 and 7. No gender differences in working are present in Waves 4 or 5. Among those working, the majority report that their work is important to them. The percentage of men and women reporting that their work is important is relatively stable over time, and ranges respectively from 71.2 to 79.1 and 65.0 to 78.1. Generally, employed individuals tend to rate work as important (i.e., who have jobs are also attached to them).

Table 18. Distribution of time-varying independent measures of the Age-graded Theory of Informal Social Control

			Wave 2 1977	Wave 3 1978	Wave 4 1979	Wave 5 1980	Wave 6 1983	Wave 7 1986
Importance of work	Men	Not working	36.1 (317)	24.5 (211)	19.1 (154)	18.8 (147)	8.5 (65)	4.5 (31)
		Job not important	14.9 (131)	21.8 (188)	17.8 (143)	17.6 (138)	21.5 (165)	20.0 (139)
		Job important	49.0 (431)	53.8 (464)	63.1 (508)	63.6 (498)	70.1 (539)	75.6 (526)
		Missing – *n*	39	55	113	135	149	222
	Women	Not working	24.7 (192)	20.1 (153)	16.8 (124)	16.7 (140)	14.9 (108)	15.2 (103)
		Job not important	18.8 (146)	27.7 (211)	21.4 (158)	17.6 (125)	22.5 (163)	19.7 (134)
		Job important	56.4 (438)	52.3 (399)	61.7 (455)	62.7 (446)	62.7 (455)	65.2 (443)
		Missing – *n*	31	44	70	96	81	127
		$X^2_{(df=2)}$	25.3***	9.35**	3.91	0.21	16.6***	45.7***
Marital attachment	Men	Not married	-	-	97.5 (831)	93.7 (779)	82.8 (658)	65.0 (451)
		Time with spouse not important	-	-	0 (0)	0 (0)	0.3 (2)	0.7 (5)
		Time with spouse important	-	-	2.5 (21)	6.3 (52)	16.9 (135)	34.3 (238)
		Missing - *n*	-	-	66	87	123	224
	Women	Not married	-	-	91.4 (697)	86.7 (646)	67.4 (492)	49.6 (337)
		Time with spouse not important	-	-	0.5 (4)	0.4 (3)	0.6 (4)	0.6 (4)
		Time with spouse important	-	-	8.1 (62)	12.9 (96)	32.1 (234)	49.9 (339)
		Missing - *n*	-	-	44	62	77	127
		$X^2_{(2)}$			31.2***	23.9***	48.5***	34.1***

Note. sd=standard deviation; *df* = degrees of freedom.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Although there is significant variation in the percentage of respondents reporting marriage over time, once married, almost all respondents report that spending quality time with their spouse is important (see Table 18). As noted above, the percentage of men and women reporting marriage increases rapidly over time and more women than men report being married at all waves. The percentage of men who report lower marital attachment ranges from 0 to 2.1 and increases over time. This pattern is different among women. Proportionally more women report lower marital attachment in earlier waves and this proportion decreases over time (6.1% to 1.2%). Given the lack of variation in marital attachment, it is likely not possible to test Sampson and Lab's proposal that marital attachment changes criminal behaviour. Several attempts to include this variable were not successful due to small numbers and issues with convergence; still, the bivariate relationship is examined regardless of these issues.

Bivariate relationships

Several of the bivariate relationships with serious criminal behaviour and the measures proposed in the Age-graded Theory of Informal Social Control are as hypothesized, although some are not significant (see Table 19). Both early conduct disorder and incarceration are associated with criminal behaviour. Those who report early criminal conduct are over 4.5 times more likely than those who do not report this behaviour to exhibit serious criminal behaviours. Likewise, those who have been incarcerated are also 73% more likely than those who have never been incarcerated to report serious criminal behaviours. The presence of delinquent peers is also predictive of serious criminal behaviour. Respondents reporting few or some delinquent peers are respectively 45% and 299% more likely than those with no delinquent peers to report serious criminal behaviours. Respondents who live in homes with only one parent are 54% more likely than those who live in two-parent households to engage in serious criminal behaviours. Additionally, one unit increase in the number of siblings is associated with a 9% increase in the likelihood of serious criminal behaviour over the life-course. Finally, those in the lower social classes are 80% more likely than those in higher classes to report serious criminal behaviours.

Only two of the measures appear to have a protective influence on serious criminal behaviour over the life-course. As parental attachment increases, there is a corresponding 2% decrease in the likelihood of serious criminal behaviour. Marriage is also related to decreases in criminal behaviours. Those who are married are 60% less likely than those who are single to report serious criminal behaviour, however, this may be confounded with age.

Table 19. Bivariate relationships between self-reported serious criminal behaviour and the measures of the Age-graded Theory of Social Control

	IRR	Random Intercept (χ^2)	Number of Observations	LL(*df*)	BIC
Early conduct disorder	4.58***	1287***	9466	-5189 (4)	10415
Incarceration	1.73*	1363***	9466	-5270 (4)	10451
Presence of delinquent peers					
Few vs. none	1.44***	1043***	10795	-5806 (5)	11657
Some vs. none	3.99***				
Parental attachment	0.98***	1263***	9320	-5433 (4)	10902
Parental deviance	1.41***	1473***	10602	-5974 (4)	11986
School involvement	1.06***	1630***	10785	-6052 (4)	12142
Social class	1.80***	1491***	10713	-6056 (4)	12149
One parent household structure	1.54***	1500***	10713	-6063 (4)	12163
Parenting disciplinary style					
Non-inductive vs. inductive	1.28	1543***	10697	-6064 (5)	12175
Semi-inductive vs. inductive	1.00				
Difficult temperament	1.52	1545***	10706	-6069 (4)	12176
Parental rejection	1.77	1628***	10842	-6087 (4)	12209
Working	0.96	1628***	10902	-6122 (4)	12280
Marriage	0.40***	1602***	10907	-6138 (4)	12315
Number of siblings	1.09**	1568***	10908	-6186 (4)	12409
Importance of work[b]					
Job not important vs. no job	1.07	1364***	9269	-4796 (4)	9637
Job not important vs. no job	0.99				
Marital attachment[c]					
Time with spouse not important vs. not married	1.17	655***	5883	-2846 (5)	5735
Time with spouse important vs. not married	0.45***				

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

[a] Regression does not include Wave 1 because this information was not collected at that time. Different reference categories were also examined; no significant differences between categories were observed.

[b] Regression does not include waves 1 through 3 because this information was not collected in these waves.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Some of the bivariate findings are contrary to the expectations outlined in the theory. Contrary to hypotheses, those reporting more involvement in school are more likely to report serious criminal behaviour. Increases in school involvement are associated with a 6% increase in the likelihood of reporting serious criminal behaviours;

however, this relationship is likely to become non-significant or switch its relationship when age is controlled for in the modelling. In addition to this, some of the proposed relationships are not significantly associated with serious criminal behaviour over the life-course.

Very few respondents report being not highly attached to their spouse. The hypothesis that individuals not experiencing informal social control from marriage are not inhibited from criminal behaviour is supported by the lack of difference between those who are married and have low marital attachment and those who are not married, although the non-significance may be related to issues of sample size. As proposed by Sampson and Laub (1993), those who are married and highly attached to their spouse are 55% less likely than those who are not married to report criminal behaviour.

Contrary to hypotheses, relationships are not found between serious criminal behaviour and parental disciplinary style, difficult temperament, parental rejection, and whether a respondent is working. The BICs of the bivariate models for the Age-graded Theory of Informal Social Control range from 10,415 to 12,409 for the variables collected over all waves. This range is in line with those observed for the other models. Some BICs are lower than seen with previous models, although this may reflect the lower numbers of observations associated with the models rather than the explanatory power of the measure. The general range of the chi-square values of random intercept is from 1,043 to 1,630. This range is similar to previous findings. The bivariate relationship between self-control and serious criminal behaviour remains by far the greatest single reduction in the chi-square value associated with the random intercept (see Table 4).

Multivariate relationships

As seen in Table 20, some hypotheses of the Age-graded Theory of Informal Social Control are supported by the results from the multivariate models. Unfortunately, it was not possible to include early conduct disorder or incarceration in the multivariate modelling due to lack of variation in these measures and issues with model convergence. The measures of two-parent household structure, marriage, and number of siblings are also not included as they do not improve model fit.

Like previous models, visible minorities are 27% more likely than Caucasians respondents to report serious criminal behaviours. (see Table 20). Women are 68% less

likely than men to report serious criminal behaviour over the life–course. All but three of the measures are positively associated with criminal behaviour. Respondents whose parents endorsed deviant behaviour are 28% more likely than respondents whose parents did not endorse criminal behaviour to report serious criminal behaviours. Those with a few or some delinquent peers are 44% and 254% more likely than those with no delinquent peers to report serious criminal behaviour. Those in lower social classes are 44% more likely than those in higher social classes to report criminal behaviour. Parental rejection is not significantly related to serious criminal behaviour, yet its inclusion improves model fit. This may be related to the relatively low number of respondents who felt rejected by their parents, which affects the ability to detect a relationship.

Table 20. Multivariate relationships between self-reported serious criminal behaviour and the measures of Age-graded Theory of Social Control

	Model: No Interactions[a]	Model: Gender Interactions[b]
	IRR	IRR
Age	1.08	1.07
Age^2	0.994**	0.994**
Ethnicity	1.27*	1.27*
Gender	0.32***	0.37***
Parental deviance	1.28**	1.28**
Presence of delinquent peers	***	***
Few vs. none	1.44***	1.44***
Some vs. none	3.54***	3.52***
School involvement	0.91***	0.91***
Social class	1.44**	1.43***
Rejection by parent	1.32	1.33
Parental attachment	0.96***	0.96***
Marriage	-	0.98
Work	-	1.11
Interaction: Gender and parental attachment	-	1.00
Interaction: Gender and marriage	-	1.07
Interaction: Gender and work	-	0.83
n	8887	8886
LL (*df*)	-4757 (14)	-4755 (19)
BIC	9641	9684
χ^2 -Random Intercept	529***	520***

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
[a]The simultaneous entry model has a BIC of 9,709.
[b]The simultaneous entry model has a BIC of 9,734.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Increases in school involvement (as expected once age was controlled) and parental attachment are associated with decreases in the likelihood of criminal behaviour.

Increases in school involvement are associated with a 9% decrease in the likelihood of serious criminal behaviours. Parental attachment is associated with decreases in the likelihood of criminal behaviour over the life-course (4%).

Three hypothesized interactions were also examined in the multivariate model. Although Sampson and Laub (1993) have not proposed any gender interactions, Giordano et al. (2002) argue that the effect of work and marriage on serious criminal behaviour may differ by gender. Furthermore, Jang and Smith (1997) find that parental attachment has differing effects on criminal behaviour by gender. These interactions were examined and contrary to the above-mentioned hypotheses, none is significant (see Table 20). Split models by gender are not examined as the lack of significance of these interactions indicates that this is unnecessary.

Separate analyses examined the effect of attachment to both job (see Table 21) and spouse. Similar to the bivariate models, the importance of work has no impact on serious criminal behaviour. As in the previous multivariate model examining the theory, none of the interactions between gender, importance of work, marriage and parental attachment are significant. As previously noted, due to only a small number of respondents reporting lower marital attachment, it is not possible to examine the multivariate relationship between lower marital attachment and serious criminal behaviour.

Overall, the model fit for the final model examining the Age-graded Theory of Informal Social Control is consistent with the previous models. Comparatively, this model is an improvement over the models for the General Theory of Crime and the Dual Taxonomy theory; however, it does not have as good a fit as the Interactional Theory. This pattern is true also for the chi-square values for the random intercept, and these values remain significant in this model as well.

Table 21. Multivariate relationships between self-reported serious criminal behaviour and the measures of Age-graded Theory of Social Control (Wave 2 on)

	Model: No Interactions IRR	Model: Gender Interactions IRR
Age	1.28*	1.29*
Age^2	0.99***	0.99***
Ethnicity	1.27*	1.28*
Gender	0.29***	0.33***
Presence of delinquent peers	***	***
Few vs. none	1.28**	1.27**
Some vs. none	3.21***	3.20***
Parental deviance	1.35**	1.35**
Social class	1.47**	1.48**
School involvement	0.91***	0.91***
Importance of work		
Job not important vs. no job	1.06	1.05
Job important vs. no job	1.05	1.04
Parental attachment	0.96***	0.96**
Marriage	-	0.87
Interaction: Gender and parental attachment	-	0.98
Interaction: Gender and marriage	-	1.35
Interaction: Gender and importance of work	-	1.01
n	7366	7365
LL (*df*)	-3670 (16)	-3669 (19)
BIC	7482	7508
χ^2 -Random Intercept	440***	443***

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Summary of the relationships between the Age-graded Theory of Informal Social Control measures and serious criminal behaviour

Several types of measures are proposed in this theory. The static background factors, namely, numbers of siblings, parental deviance, one-parent household parental rejection and social class all support hypotheses of the theory. Regarding individual differences in temperament and propensity to criminal behaviour, the effects of early conduct disorder are also in line with theoretical hypotheses; yet, they are quite rare, especially among women. Contrary to hypotheses, parental discipline style, parental rejection, and difficult temperament are not related to serious criminal behaviour.

There is support for time-varying measures of the theory. As hypothesized, presence of delinquent peers and incarceration are positively associated with serious criminal behaviour; however, the rarity of incarceration presented modelling challenges in the multivariate context. Both parental attachment and involvement with school are inversely related to the outcome, which is consistent with hypotheses. Hypotheses

regarding job attachment are not supported. Limited support of the hypotheses regarding marital attachment is evident. Overall, the best model from this theory of criminal behaviour includes only the following measures: parental deviance, delinquent peers, school involvement, parental rejection, parental attachment, and social class. The effect of these variables are consistent with their hypothesized relationships. No interactions with gender are significant and therefore split modelling by gender was not undertaken.

Overall, the measures of model fit are in the range of other models and provide a moderate explanation of serious criminal behaviour, however, it does deviate from several propositions of the theory.

Additional factors theorized to account for the criminal behaviour of women: Women-specific measures

Beyond the factors included in the traditional life-course theories, several factors are theorized as essential to accounting for the development of criminal behaviour of women.

Univariate distributions

There is only one women-specific time-invariant measure examined here: belief in traditional sex roles. Men endorse beliefs in traditional sex roles more than women (14.6 vs. 13.1, $t_{(15116)} = 9.54$, $p < 0.0001$).[53] These scores, however, correspond with disagreement with traditional gender roles.

Several time-varying measures, argued to be important in explaining the criminal behaviour of women, are also examined. In terms of experiencing an assault, whether physical or sexual, the reports of their occurrence decreased over time for both men and women (see Table 22). Women and men, on average, reported less than one incident of physical assault by a parent in any given year (0 to 0.9). Men, however, report being physically assaulted by others at a mean of at least twice that of women, with the exception of Wave 7. For example, in Wave 3, men, on average, report 0.8 incidents of physical assault whereas women report 0.3 incidents. Women report a higher mean of sexual assault than men in all waves except Waves 2 and 7. Over the different waves of the survey, women report means of sexual assault ranging from 0.02 to 0.05 compared to the range of 0 to 0.03 reported by men. These differences are not significant.

[53] Standard deviation for men and women is 2.9 and 3.4 respectively. In term of missing data, 5.3% (49) of men are missing a score and 4.7% (38) of women.

Table 22. Distribution of time-varying measures selected to account for the criminal behaviour of women

			Wave 1 1976	Wave 2 1977	Wave 3 1978	Wave 4 1979	Wave 5 1980	Wave 6 1983	Wave 7 1986
Physical assaulted by parents	**Men**	**Mean (*sd*)**	0.16 (0.82)	0.08 (0.49)	0.07 (0.83)	0.01 (0.15)	0.02 (0.17)	0.02 (0.38)	0.00 (0.00)
		Missing % (*n*)	0.03 (3)	46.5 (427)	6.0 (55)	12.3 (113)	14.7 (135)	16.2 (149)	23.7 (218)
	Women	**Mean (*sd*)**	0.63 (13.02)	0.87 (17.10)	0.23 (2.71)	0.07 (0.73)	0.08 (0.91)	0.02 (0.17)	0.00 (0.04)
		Missing % (*n*)	0.4 (3)	43.5 (351)	5.5 (44)	8.6 (69)	11.9 (96)	10.0 (81)	15.5 (125)
		***t* (*df*)**	-1.1 (809)	-1.0 (456)	-1.5 (887)	-2.1* (793)	-1.9 (757)	0.3 (1086)	-1.0 (681)
Physical assaulted by others (not parent)	**Men**	**Mean (*sd*)**	1.6 (7.0)	1.0 (7.2)	0.8 (4.5)	0.8 (3.6)	0.6 (2.8)	0.5 (3.9)	0.5 (2.5)
		Missing % (*n*)	0.3 (3)	4.2 (39)	6.0 (55)	12.3 (113)	14.7 (135)	16.2 (149)	23.7 (218)
	Women	**Mean (*sd*)**	0.4 (1.9)	0.4 (3.7)	0.3 (3.7)	0.3 (1.0)	0.3 (1.3)	0.2 (1.3)	1.1 (19.3)
		Missing % (*n*)	0.4 (3)	3.8 (31)	5.5 (44)	8.6 (69)	11.9 (96)	10.0 (81)	15.4 (124)
		***t* (*df*)**	4.7*** (1056)	2.2* (1348)	2.1* (1618)	3.8*** (946)	3.1** (1137)	2.1* (929)	-0.8 (705)
Sexually assaulted[a]	**Men**	**Mean (*sd*)**	0.01 (0.13)	0.00 (0.14)	0.01 (0.09)	0.01 (0.15)	0.01 (0.07)	0.00 (0.06)	0.03 (0.76)
		Missing % (*n*)	0.5 (5)	4.5 (41)	6.0 (55)	12.3 (113)	14.7 (135)	16.2 (149)	23.7 (0.42)
	Women	**Mean (*sd*)**	0.05 (0.42)	0.02 (0.14)	0.05 (0.57)	0.03 (0.17)	0.04 (0.28)	0.03 (0.21)	0.04 (0.45)
		Missing % (*n*)	0.6 (5)	4.0 (32)	5.5 (44)	8.7 (70)	11.9 (96)	10.0 (81)	15.4 (124)
		***t* (*df*)**	-2.2* (941)	-1.2 (1650)	-2.0* (795)	-2.5* (1456)	-3.3* (793)	-3.2* (840)	-0.4 (1144)

Note. sd=standard deviation; *df* = degrees of freedom.

[a]The standard deviations for physical assault by parents for women in Waves 1 and 2 are high due to the a few outliers present in distribution of the count data. For example, a few women in these Waves reported physical assault at least one a day or once a week, whereas most women and men report no or only one event of this type in any given year.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Perceived disapproval by others is theorized to have a larger impact on the criminal behaviour of women than men (see Table 23). In every wave, women score higher than men for perceived disapproval of criminal behaviour by parents, by approximately half a point in each wave. The perception of disapproval by parents is

stable over time. Similarly, perceived disapproval by peers remains stable across the waves, with a slight decrease by Wave 7. Scores for men range from 19.7 to 21.1, while scores for women are slightly higher – ranging from 21.6 to 22.5. Again, in all waves, women score higher than men on their perceived disapproval of criminal behaviour by peers, by approximately one point.

Women are expected to have fewer attitudes favouring criminal behaviour, and as such be involved in these behaviours less often than men (see Table 23). Men report significantly more favourable attitudes towards criminal behaviour than women at all waves (approximately one point more). These attitudes are relatively stable over time, with men reporting scores ranging from 7.0 to 7.7 and women from 6.2 to 6.6.

Pregnancy may also have an impact on the criminal behaviour of women. Overtime, the percentage of women reporting a pregnancy increased each year, from 3.3% in the first wave to 42.4% in the seventh wave (see Table 23).

Table 23. Distribution of time-varying measures argued to account for the criminal behaviour of women

			Wave 1 1976	Wave 2 1977	Wave 3 1978	Wave 4 1979	Wave 5 1980	Wave 6 1983	Wave 7 1986
Perceived disapproval by Parents of criminal behaviour	**Male**	**Mean (*sd*)**	23.1 (2.1)	23.0 (2.1)	23.0 (2.1)	23.0 (2.0)	23.0 (2.0)	23.1 (2.0)	23.0 (2.1)
		Missing % (*n*)	0.5 (5)	4.2 (39)	6.1 (56)	12.4 (114)	14.7 (135)	16.3 (150)	24.2 (222)
	Female	**Mean (*sd*)**	23.6 (1.8)	23.6 (1.8)	23.7 (1.7)	23.6 (1.7)	23.6 (1.8)	23.7 (1.8)	23.8 (1.8)
		Missing % (*n*)	0.6 (5)	4.1 (33)	5.8 (47)	8.7 (70)	12.0 (97)	10.2 (82)	154 (124)
		***t* (*df*)**	-5.2*** (1712)	-6.3*** (1651)	-7.6*** (1614)	-6.1*** (1539)	-6.0*** (1491)	-6.8*** (0.67)	-8.0*** (1335)
Perceived disapproval by peers of criminal behaviour	**Male**	**Mean (*sd*)**	20.2 (3.2)	19.9 (2.9)	19.7 (2.9)	20.0 (3.1)	20.1 (3.0)	19.7 (3.1)	21.1 (2.9)
		Missing % (*n*)	1.4 (13)	5.8 (23)	6.6 (61)	12.5 (115)	14.8 (136)	16.4 (151)	24.2 (222)
	Female	**Mean (*sd*)**	21.6 (2.8)	21.6 (2.7)	21.6 (2.7)	21.8 (2.8)	21.8 (2.7)	21.4 (2.7)	22.5 (2.5)
		Missing % (*n*)	1.7 (14)	5.2 (42)	6.2 (50)	9.0 (73)	12.1 (98)	10.4 (84)	16.0 (129)
		***t* (*df*)**	-9.6*** (1696)	-12.2*** (1624)	-13.5*** (1603)	-12.7*** (1535)	-11.5*** (1489)	-10.9*** (1480)	-9.6*** (1351)
Attitudes favouring criminal behaviour	**Male**	**Mean (*sd*)**	7.0 (2.09)	7.2 (2.19)	7.5 (2.24)	7.6 (2.37)	7.7 (2.38)	7.3 (2.23)	7.1 (2.26)
		Missing % (*n*)	0.4 (4)	4.2 (39)	6.2 (57)	12.4 (114)	14.7 (135)	16.4 (151)	23.9 (219)
	Female	**Mean (*sd*)**	6.3 (1.6)	6.3 (1.7)	6.5 (1.8)	6.5 (2.0)	6.6 (2.0)	6.3 (1.8)	6.2 (1.7)
		Missing % (*n*)	0.4 (3)	4.0 (32)	5.5 (44)	8.8 (71)	11.9 (96)	10.2 (82)	15.4 (124)
		***t* (*df*)**	8.0*** (1671)	9.9*** (1623)	9.4*** (1613)	9.5*** (1521)	9.8*** (1484)	9.4*** (1460)	8.9*** (1295)
Pregnancy[a]	**Female**	**Yes % (*n*)**	3.3 (9)	6.2 (17)	11.2 (31)	18.5 (51)	24.3 (67)	34.8 (96)	42.4 (128)

Note. sd=standard deviation; *df* = degrees of freedom.

[a] Percentage missing is the same across all categories because this information was collected retrospectively in Wave 7. Therefore, not all respondents were available to provide responses. 65.8% (n=531) of women did not provide this information.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Bivariate relationships

Contrary to that hypothesized, pregnancy status (women only) and physical assault by parents are not associated with the likelihood of serious criminal behaviour (see Table

24). As proposed, beliefs in traditional sex roles, attitudes favouring criminal behaviour, physical assault by others, and sexual assault are all positively associated with serious criminal behaviour. For example, increases in endorsing traditional sex roles correspond to a 9% increase in the likelihood of serious criminal behaviour. Those with the highest endorsement of traditional sex roles are over five times more likely than those with the lowest endorsement to report serious criminal behaviours. Each unit increase in experiencing physical and sexual assault by others are related to respective increases of 1% and 10% in the likelihood of criminal behaviour. The likelihood of serious criminal behaviour increases by 18% as attitudes favouring crime increase.

Table 24. Bivariate relationships between self-reported serious criminal behaviour and additional women-specific measures

	IRR	Random Intercept (χ^2)	Number of Observations	LL(*df*)	BIC
Assaulted by parent	1.00	1418***	10195	-5735 (4)	11507
Perceived disapproval by peers of criminal behaviour	0.82***	816***	10823	-5772 (4)	11582
Beliefs regarding traditional sex roles	1.09***	1516***	10614	-5930 (4)	11895
Attitudes favouring criminal behaviour	1.18***	1184***	10891	-5986 (4)	12009
Perceived disapproval by parents of criminal behaviour	0.91***	1454***	10884	-6067 (4)	12171
Assaulted by others	1.01***	1626***	10902	-6109 (4)	12255
Sexually assaulted	1.10**	1619***	10897	-6111 (4)	12258
Pregnancy[a]	0.71	383***	5197	-1679 (4)	3393

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
[a]Analyses conducted with women only.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Perceived disapproval of criminal behaviour by parents and peers are both negatively associated with serious criminal behaviour over the life-course, as expected. Decreases in the perceived disapproval of criminal behaviour by parents and peers respectively correspond to a 9% and 18% decrease in the likelihood of this behaviour.

The BIC for the bivariate models ranged from 11,507 to 12,258 and the chi-square value associated with the random intercept is significant. This suggests that additional factors are needed to explain serious criminal behaviour. Perceived disapproval by peers has the lowest chi-square value associated with a random intercept (816) observed for all of the bivariate relationships with serious criminal behaviour.

Multivariate relationships

Two multivariate models are examined (see Table 25) - first examining the effects of the women-specific variables without gender interactions, and second including the hypothesized gender interactions. Given the significance of the gender interaction model, split models by gender are examined. The following observations are briefly noted in regard to the main effects models for all respondents. As hypothesized, endorsement of traditional sex roles, attitudes favouring criminal behaviour, experiencing physical assault by others, and experiencing sexual assault are positively related to serious criminal behaviour (see Table 25). Perceived disapproval of criminal behaviour by peers is negatively related to serious criminal behaviour. Contrary to hypotheses, perceived disapproval by parents and physical assault by parents are not associated with serious criminal behaviour over the life-course.

The multivariate model improves greatly upon the BICs and the chi-square value of the random intercepts for the bivariate models (Multivariate BIC: 10,056 vs. Bivariate BIC: 11,507 to 12,258). In comparison to the previously examined multivariate models, the BIC of the women-specific model falls in the middle; however, the chi-square value of the random intercept is the second highest of all of the models. Although the BIC for a simultaneous entry of all gender interaction is greater than that of the multivariate model (10,082 vs. 10,056), a model was also built only including the gender interactions that improved model fit, this model has a lower BIC (10,051) than of both the main effects multivariate model and the simultaneous entry model with all gender interaction. This finding further supports the decision to examine the effects of women-specific variables within models that have been split by gender.

Table 25. Multivariate relationships between self-reported serious criminal behaviour and additional women-specific variables

	Model: No Interactions[a] IRR	Model: Gender Interactions IRR
Age	1.08	1.10
Age^2	0.99**	0.99**
Ethnicity	1.16	1.15
Gender	0.38***	1.28
Perceived disapproval by peers of criminal behaviour	0.86***	0.87***
Beliefs regarding traditional sex roles	1.03*	1.03
Attitudes favouring criminal behaviour	1.08***	1.07***
Physically assaulted by others	1.01***	1.01***
Sexually assaulted	1.11**	1.12**
Physically assaulted by parents	1.00	1.07**
Interaction: Perceived disapproval by peers of criminal behaviour& gender	-	0.93**
Interaction: Physically assaulted by parents and gender	-	0.94**
Interaction: Belief regarding traditional sex roles & gender	-	1.01
Interaction: Attitudes favouring criminal behaviour & gender	-	1.01
Interaction: Physically assaulted by others & gender	-	0.99
Interaction: Sexually assaulted & gender	-	0.93
n	9829	9829
LL (*df*)	-4968 (13)	-4954 (19)
BIC	10056	10082
χ^2 -Random Intercept	652***	626***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; Bayesian Information Criterion.
[a]The simultaneous entry model had a BIC of 10,057.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Several differences are present in the models of serious criminal behaviour of men and women. First, only two of the effects interact with gender. The most support for the women-specific hypotheses is provided by the measures of perceived disapproval of criminal behaviour by peers. Increases in perceived disapproval by peers correspond with decreases in the likelihood of serious criminal behaviour among both men and women, although the effect is larger for women (men: -13% vs. women: -17%). Additionally, increases in physical assault by parents are related to 7% increases in the likelihood of reporting serious criminal behaviours among women only, which contrary to arguments regarding its importance in explaining the criminal behaviour of men.

Other differences in the effects of measures by gender are also present in the split models, however, these should be regarded with caution since they are not associated with significant interactions in the model of all respondents. Most notably, some of the measures hypothesized to be important in accounting for the criminal behaviour of

women are in fact significant for men only (see Table 26). Increases in physical assault by others correspond with a 1% increase in the likelihood of criminal behaviour. A one-unit increase in being sexually assaulted results in a 12% increase in the likelihood of criminal behaviour. Age is significant only for men and is curvilinear. Yet, ethnicity is significant only for women. Visible minority women are 49% more likely than Caucasian women to report criminal behaviour.

Little support for the differences by gender are present in the split models by gender. For example, beliefs regarding traditional sex roles are not associated with the serious criminal behaviour of men or women. Increases in favouring attitudes correspond respectively with a 7% and 8% increase in the likelihood of criminal behaviour among men and women. Again, pregnancy is not a significant factor in explaining serious criminal behaviour over the life-course for women.

Table 26. Multivariate relationships between additional women-specific variables and self-reported serious criminal behaviour

	Women IRR	Women IRR	Men IRR
Age	0.88	0.88	1.21**
Age^2	1.00	1.00	0.99***
Ethnicity	1.49*	1.49*	1.04
Perceived disapproval by peers of criminal behaviour	0.83***	0.83***	0.87***
Beliefs regarding traditional sex roles	1.02	1.02	1.03
Attitudes favouring criminal behaviour	1.08**	1.08**	1.07***
Physically assaulted by others	1.00	1.01	1.01***
Sexually assaulted	1.03	1.03	1.12**
Physically assaulted by parents	1.00	1.00	1.07***
Pregnancy	-	1.02	-
n	4707	4707	5122
LL (*df*)	-1349 (12)	-1349 (13)	-3587 (12)
BIC	2799	2807	7277
χ^2 -Random Intercept	179***	177**	450***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

As with the BICs of previous split models, there are significant decreases in this measure from the model for all respondents, mostly related to the smaller number of observations. The BIC for the women's model is significantly smaller than that of the BIC for the men's model (BIC: 2,799 vs. 7,277). Again, this may reflect the smaller variance associated with the criminal behaviour of women compared to men. The model

of the women-specific measures outperforms the split models for the General Theory of Crime or the Dual Taxonomy theory. Like these models, the chi-square value of the random intercepts for both of the gender-specific models remained significant, leaving a significant proportion of variance unexplained by the models, although these are the lowest chi-square value of the random intercepts observed in the split models.

Summary of the relationships between women-specific measures and serious criminal behaviour

With the exception of experiencing physical assault by parents and pregnancy, the examination of the women-specific variables among all respondents generally supported the expected relationships with serious criminal behaviour. These hypotheses, however, are specific to women, and when gender interactions are examined little support for the hypotheses is found. Some support for the perceived disapproval of criminal behaviour having a larger effect for women is noted in the split model. Overall, the model fit of this set of measures is in the range of other models.

Summary of Findings of all Theories used to Explain Serious Criminal Behaviour

In examining the impact of various measures proposed in life-course theories, it becomes quickly apparent that some of their effects are not as originally hypothesized, using the NYS data (see Table 27). Some of the hypothesized relationships do not achieve significance, and in a handful of cases, the effect is in the direction opposite to that hypothesized. In terms of the measures and their effects as proposed in these theories, relatively weak support is evident. For example, contrary to hypotheses, parental attachment remained significant in the multivariate model and the interaction effect between self-control and opportunity to commit criminal behaviour is opposite to that expected, although the main effects of the General Theory of Crime measures are as hypothesized. In the case of the Interactional Theory, four of nine proposed associations are not as hypothesized. Three of these are not significant in explaining serious criminal behaviour over the life-course and one measure has an effect in the direction opposite to that hypothesized. Although the main effects proposed in the Dual Taxonomy theory are significant and in expected directions, none of the interactions is significant.

Table 27. Summary of support for the life-course theories

Theory and Measures	Hypotheses Support	Gender Invariance Hypothesis Support	Theory Support
General Theory of Crime			
Parental attachment	Mixed	×	WEAK
Self-control	✓	×	
Opportunity for criminal behaviour	✓	✓	
Interaction: Self-control & opportunity	×	×	
Interactional Theory			
Presence of children	×		WEAK
Parental attachment	✓		
Presence of delinquent peers	✓		
Commitment to school	✓	✓ no gender interactions tested	
Social class	✓		
Conventional beliefs – Importance of School	✓		
Conventional beliefs – Importance of Work	× NS		
Conventional activities	× NS		
Marriage	× NS		
Dual Taxonomy			
Parental deviance (PD)	✓	×	WEAK
Neuropsychological deficits	✓	×	
Peer rejection and knowledge of delinquent peers	✓	×	
Parental disciplinary style (PDS)	× NS	-	
Interaction: Neuropsychological deficits & PD	× NS	-	
Interaction: Neuropsychological deficits & PDS	× NS	-	
Age-graded Theory of Informal Social Control			
Early conduct disorder	✓		WEAK
Incarceration	✓		
Parental attachment	✓		
Parental deviance	✓		
Presence of delinquent peers	✓		
School involvement	✓		
Social class	✓	✓ no gender interactions tested	
One parent household structure	× NS		
Parenting disciplinary style	× NS		
Difficult temperament	× NS		
Parental rejection	× NS		
Working	× NS		
Marriage	× NS		
Number of siblings	× NS		
Importance of work	× NS		
Marital attachment	Mixed		
Women-specific measures			
Assaulted by parent	× NS	✓	LITTLE SUPPORT FOR GENDER-SPECIFIC HYPOTHESES
Perceived disapproval by peers of criminal behaviour	✓	×	
Beliefs regarding traditional sex roles	✓	✓	
Attitudes favouring criminal behaviour	✓	✓	
Perceived disapproval by parents of criminal behaviour	× NS	-	
Assaulted by others	✓	×	
Sexually assaulted	✓	×	
Pregnancy	× NS	-	

Note. ✓ In line with hypotheses; × Significant and in opposite direction of hypothesis; × NS – against hypotheses because association it not significant; Mixed – provides some evidence for one or more hypotheses; - not tested.

Many of the background factors and some of the central measures of the Age-graded Theory of Informal Social Control do not add significantly to the explanation of serious criminal behaviour over the life-course. Overall, the support for this theory is weak. Finally, the majority of effects of the women-specific variables are contradictory to hypotheses of their importance in explaining the criminal behaviour of women.

If each of these theories are solely evaluated for the number of hypothesized effects validated in the present study, all theories would be considered weak, however, the results for both the Dual Taxonomy and General Theory of Crime strayed the least from original hypotheses; yet, there are fewer hypotheses to be tested with these theories.

Three of the five sets of measures examined in this study provide evidence that gender-specific modelling may be necessary. In particular, these gender interactions are contrary to the gender invariant arguments associated with both the General Theory of Crime and the Dual Taxonomy. Moreover, on the whole, the women-specific measures did not perform as expected and relatively small differences in the effects of measures in the split modelling were noted. Taken as a whole, this may suggest gender-specific modelling is not necessary, although gender interactions are significant.

Measures of model fit suggest that the some of the proposed models are better than others in accounting for the variance in serious criminal behaviour over the life-course. According to the BICs, Interactional Theory provided the best fit of all of the models examined, followed by the Age-graded Theory of Informal Social Control, the model examining women-specific measures, the Dual Taxonomy, and lastly, the General Theory of Crime. Regardless of model fit, all of the models have significant chi-square value of the random intercepts, which suggests that additional variables could be useful in explaining serious criminal behaviour.

As a lesson learnt from all the analyses done so far, three steps can be taken to further assess how additional variables could be combined to more fully explain serious criminal behaviour over the life-course:

1) combine the variables of each of the life-course theories with the women-specific measures into a model examining how these combinations account for the development of criminal behaviour over the life-course, and check if the chi-square values of the random intercepts of these models remain significant;

2) combine all of the variables examined in this study and build the best fitting model to explain serious criminal behaviour, and check if the chi-square values of the random intercepts still remain significant;
3) examine how criminal and other behaviours in the past may be related to present criminal behaviour (i.e., examine the state dependence or lag effects of serious criminal and other behaviours).

Step 1: Multivariate Extensions of the Life-course Theories and the Women-specific Measures

This section explores the effects of each of the measures in the life-course theory while including the effects of women-specific measures. Each of the four life-course theories are combined with the women-specific measures. In total, four models are examined for each of the theories: 1) main effects model for all respondents, 2) model with gender interactions for all respondents, 3) main effects model for women, and 4) main effects model for men. In cases where gendered interactions are significant, the focus is on the split models.

The General Theory of Crime and women-specific measures

The combination of the measures of the General Theory of Crime and the Women-specific measures improve upon the ability of either model to predict serious criminal behaviour (General Theory of Crime BIC: 11,245; Women-specific BIC: 10,057; Combined BIC: 9,665) (see Table 28). Furthermore, the chi-square value of the random intercept (RI) for this combination of variables is lower than previously noted for the individual models, although it remains significant (General Theory of Crime RI: 624; Women-specific RI: 642; Combined RI: 377). In addition to the improvement in the modelling through the combination of measures, several of the gender interactions in the second model are significant, which suggests that gender-specific modelling maybe advantageous in understanding how the explanation of serious criminal behaviour over the life-course differs by gender.

The effects of most measures in the combined models remain similar to those observed in the individual models, although the effects of the measures of the General Theory of Crime are reduced in the presence of the women-specific measures. One notable difference between the combined model and the individual models is that the

interaction between self-control and opportunity decreases the explanatory power of the model and is contrary to the hypothesized effect; therefore, it is not included in the present models. Otherwise, most of the initial findings are replicated

Table 28. An extended model of the General Theory of Crime, women-specific measures and self-reported serious criminal behaviour

	Model: No Gender Interactions[a]	Model: Gender Interactions	Women[b]	Men
	IRR	IRR	IRR	IRR
Age	0.96	0.98	0.72*	1.10
Age^2	1.00	1.00	1.00	0.99*
Ethnicity	1.28**	1.28**	1.69***	1.15
Gender	0.46***	1.20	-	-
Physically Assaulted by parents	1.00	1.06*	1.00	1.06**
Perceived Disapproval by peers of criminal behaviour	0.88***	0.89***	0.86***	0.88***
Beliefs regarding traditional sex roles	1.03**	1.02	1.05*	1.02
Attitudes favouring criminal behaviour	1.06***	1.06***	1.08**	1.05***
Self-control	1.21***	1.21***	1.26***	1.20***
Opportunity for criminal behaviour	1.03**	1.02***	1.04***	1.03***
Parental attachment	0.97*	0.99	0.94*	0.99
Physically assaulted by others	1.01***	1.01***	1.01	1.01***
Sexually assaulted	1.10**	1.12**	1.00	1.12**
Interaction: Gender and physically assaulted by parents	-	0.94**		
Interaction: Gender and perceived disapproval by peers of criminal behaviour	-	0.95*		
Interaction: Gender and belief regarding traditional sex roles	-	1.04		
Interaction: Gender and attitudes favouring criminal behaviour	-	1.02		
Interaction: Gender and self-control	-	1.00		
Interaction: Gender and opportunity	-	1.02*		
Interaction: Gender and parental attachment	-	0.95*		
Interaction: Gender and physically assaulted by others	-	0.99		
Interaction: Gender and sexually assaulted	-	0.91		
n	9742	9742	4663	5079
LL (*df*)	-4759 (16)	-4742 (25)	-1281 (15)	-3440 (15)
BIC	9665	9713	2688	7008
χ^2 -Random Intercept	377***	370***	144***	246***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

[a]Simultaneous Entry Model BIC is 9,665.

[b]Pregnancy was examined among women. It reduced the model's BIC and was not significant.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Overall, the combination of these two sets of measures indicates an improvement in the explanatory power of the proposed measures. Nonetheless, the chi-square value of the random intercept could still be improved upon suggesting better models are possible.

The Interactional Theory and women-specific measures

The addition of the significant women-specific variables to the Interactional Theory Model (see Table 29) results in an improvement upon both of the individual models (Interactional Theory BIC: 8,072; Women-specific BIC: 10,057; Combined BIC: 7,142). Moreover, this combination is better than the combined model for General Theory of Crime and women-specific measures (BIC: 9,655). The chi-square value of the random intercept of this particular combination (with a chi-square of 256) is also better than either of these sets of variables modelled individually, and better than the combination of the General Theory of Crime and women-specific variables (Interactional Theory RI: 437; Women-specific RI: 642; General Theory and women-specific measures combined RI: 377). Yet, the chi-square value of the random intercepts associated with this particular combination remains significant. Some of the gender interactions are significant, therefore, only the gender-specific models are discussed.

Like the combined General Theory of Crime and women-specific measures model, the majority of the measures have effects similar to those observed in the individual main effects models. Due to a lack of significant gender interactions in the initial modelling for Interactional Theory, split models were not run in the initial modelling; however, these models were undertaken with the women-specific variables and the majority of effects remain intact in the combined model. Within the model including all respondents, the results of the combined models are similar to the individual Interactional Theory model. Two exceptions are present and contradict original hypotheses. Both commitment to school and conventional beliefs regarding traditional sex roles are no longer associated with serious criminal behaviour, as hypothesized by the Interactional Theory. Interestingly, some of the hypotheses regarding gender invariance are examined here and many of these findings are contradictory to hypotheses. Although the effect of parental attachment is in the expected direction, it is only associated with the serious criminal behaviours of men. The effect of the presence of children is not in the

expected direction, and is only significant among women. But, neither of these effects are associated with significant interactions with gender.

Table 29. An extended model of the Interactional Theory, women-specific measures and self-reported serious criminal behaviour

	Model: No Gender Interactions[a]	Model: Gender Interactions	Women[b]	Men
	IRR	**IRR**	**IRR**	**IRR**
Age	1.01	1.04	0.72	1.17
Age^2	0.997	0.997	1.00	0.99
Ethnicity	1.24*	1.22	1.55*	1.13
Gender	0.42***	0.92	-	-
Presence of children	1.85*	2.02	2.28*	1.93
Parental attachment	0.96***	0.96***	0.97	0.96***
Physically assaulted by parent	1.00	1.09**	0.99	1.10**
Perceived Disapproval by peers of criminal behaviour	0.89***	0.90***	0.86***	0.89***
Beliefs regarding traditional sex roles	1.01	1.01	1.03	1.01
Presence of delinquent peers	***	***	***	***
Few vs. none	1.62***	1.60***	2.53***	1.41**
Some vs. none	2.96***	2.95***	6.20***	2.40***
Commitment to school	1.01	1.01	1.03	0.99
Attitudes favouring criminal behaviour	1.05**	1.05**	1.03	1.05**
Social class	1.44**	1.46***	1.48	1.40**
Conventional beliefs – Importance of school	0.89***	0.89***	0.91	0.88***
Assaulted by others	1.02***	1.02***	1.03*	1.02**
Sexually assaulted	1.09	1.83**	0.99	1.91**
Interaction: Gender and physically assaulted by parent	-	0.91***	-	-
Interaction: Gender and perceived disapproval by peers of criminal behaviour	-	0.93**	-	-
Interaction: Gender and beliefs regarding traditional sex roles	-	1.03	-	-
Interaction: Gender and attitudes favouring criminal behaviour	-	0.99	-	-
Interaction: Gender and assaulted by others	-	1.02	-	-
Interaction: Gender and sexually assaulted	-	0.56*	-	-
Interaction: Gender and presence of children	-	0.88	-	-
Interaction: Gender and parental attachment	-	1.02	-	-
n	6971	6971	3310	3661
LL (*df*)	-3483 (20)	-3467 (28)	-947 (19)	-2496 (19)
BIC	7142	7182	2048	5148
χ^2 -Random Intercept	256***	239***	73***	168***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

[a]Simultaneous entry model has a BIC of 7,181.

[b]Pregnancy was examined among women. It reduces the model's BIC and is not significant.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Similar to the model with combined General Theory of Crime and women-specific measures, the combination of the measures of the Interactional Theory and the women-specific measures improves the overall model. On the other hand, the reduction in number of available observations of this combination may impede the ability to find significant relationships between these variables and serious criminal behaviour for women. Further improvements can be made upon this model As evidenced by a significant chi-square value of the random intercept.

The Dual Taxonomy and women-specific measures

The combination of measures from the Dual Taxonomy with women-specific measures (see Table 30) has a better ability to account for serious criminal behaviour over the life-course than the two sets of measures individually (Dual Taxonomy BIC: 11,087; Women-specific BIC: 10,057; Combined BIC: 9,323). This combination model is better than the one with the measures of the General Theory of Crime, but worse than the one with the measures of the Interactional Theory. Like previous combination models, the variance of the random intercept (RI: 506) has also improved but remains significant and much larger than the other combination models (General Theory and women-specific measures combined RI: 377; Interactional Theory and women-specific measures combined RI: 256). As in previous models, some of the gender interactions are significant, and therefore, only the gender-specific models are discussed.

Similar to the earlier combination models, the majority of the effects for specific measures do not change significantly from the individual models. Yet, there are notable changes in the effects of neuropsychological deficits in the combined model. It is no longer significant in any of the models. These changes in significance may be related to the fact that few respondents have neuropsychological deficits and changes in the number of observations may affect estimates of the standard error, which affects significance. Given the issues with small numbers, it is unlikely that neuropsychological deficits will remain in future models.

Table 30. An extended model of the Dual Taxonomy, women-specific measures and self-reported serious criminal behaviour

	Model: No Interactions[a]	Model: Gender Interactions	Women[b]	Men
	IRR	**IRR**	**IRR**	**IRR**
Age	1.06	1.09	0.84	1.21**
Age^2	0.995*	0.995**	1.00	0.993***
Ethnicity	1.20*	1.19*	1.49*	1.09
Gender	0.42***	0.77	-	-
Physically assaulted by parents	1.00	1.07**	1.00	1.08***
Perceived disapproval by peers of criminal behaviour	0.88***	0.88***	0.86***	0.88***
Beliefs regarding traditional sex roles	1.04**	1.03	1.04	1.04*
Parental deviance	1.06***	1.06***	1.08**	1.04**
Attitudes favouring criminal behaviour	1.07***	1.06***	1.07*	1.06***
Neuropsychological deficits	1.30	1.35	1.18	1.37
Knowledge of delinquent peers	***	***	***	***
No peers vs. delinquent peers	0.66***	0.71***	0.52***	0.69***
Non-delinquent peers vs. delinquent peers	0.22***	0.24***	0.16***	0.26***
Assaulted by others	1.01***	1.01***	1.04**	1.01***
Sexually assaulted	1.09**	1.11*	1.02	1.11*
Interaction: Gender and neuropsychological deficits	-	0.86	-	-
Interaction: Gender and knowledge of delinquent peers	-	0.81*	-	-
Interaction: Gender and physically assaulted by parents		0.93**		
Interaction: Gender and perceived disapproval by peers of criminal behaviour	-	0.95*	-	-
Interaction: Gender and belief regarding traditional sex roles	-	1.02	-	-
Interaction: Gender and attitudes favouring criminal behaviour	-	1.00	-	-
Interaction: Gender and assaulted by others	-	1.03**	-	-
Interaction: Gender and sexually assaulted	-	0.94		
n	9349	9349	4439	4910
LL (*df*)	-4589 (16)	-4569 (26)	-1225(16)	-3329 (16)
BIC	9323	9367	2585	6795
χ^2 -Random Intercept	506***	488***	128***	355***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

[a]Simultaneous entry model has a BIC of 9,333.

[b]Pregnancy was examined among women, and it reduces the model's explanatory power and is not significant.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The Age-graded Theory of Informal Social Control and women-specific measures

The combination of the Age-graded Theory of Informal Social Control and the women-specific measures provides a more powerful explanation of serious criminal behaviour than either set of measures individually (see Table 31). The combined model's BIC is 8,347, which is an improvement over each of the individual models, and outperforms other combination models examined here with the exception of the model that combines women-specific measures and Interactional Theory (BIC: 7,142). Similar to previous findings, the chi-square value of the random intercept of the combined model is an improvement over the individual models but remains significant (RI: 341). Again, when comparing the random intercept of the combined model with the random intercepts of other combined models, only the model combining the Interactional Theory and women-specific measures outperforms this particular combination of measures.

The addition of the women-specific measures to the measures of the Age-graded Theory of Informal Social Control has similar effects as their addition to previous models. Contrary to hypotheses of the Age-graded Theory of Informal Social Control, social class no longer adds significantly to the explanation of serious criminal behaviour over the life-course and is no longer included in the final model. Again, contrary to hypotheses, parental attachment is only significant among men. In addition to this, the effect of delinquent peers is as expected, but the effect is larger among women, although no hypotheses were actually presented regarding this gendered effect and neither of these effects were associated with a significant gender interaction. The remaining effects are in line with the original hypotheses. Taken as a whole, although the model is an improvement, a better explanatory model for serious criminal behaviour is possible given that the chi-square value of the random intercept remains significant.

Table 31. An extended model of the Age-graded Theory of Social Control, women-specific measures and self-reported serious criminal behaviour

	Model: No Interactions	Model: Gender Interactions	Women	Men
	IRR	IRR	IRR	IRR
Age	0.99	1.02	0.71	1.14
Age^2	0.997	0.996	1.00	0.993**
Ethnicity	1.30**	1.30*	1.95***	1.14
Gender	0.42***	1.00	-	-
Parental attachment	0.97**	1.10***	0.97	0.98**
Physically assaulted by parent	1.00	0.97**	1.00	1.10***
Perceived disapproval by peers of criminal behaviour	0.89***	0.90***	0.87***	0.89***
Beliefs regarding traditional sex roles	1.04**	1.03*	1.04	1.03*
Parental deviance	1.31***	1.30***	1.41*	1.25**
Presence of delinquent peers	***	***	***	***
Few vs. none	1.47***	1.46***	2.15***	1.31**
Some vs. none	2.80***	2.78***	5.49***	2.35***
Attitudes favouring criminal behaviour	1.05***	1.05***	1.05	1.05***
School involvement	0.93***	0.93***	0.91*	0.94**
Physically assaulted by others	1.01***	1.01***	1.03*	1.02***
Sexually assaulted	1.16**	1.42*	1.05	1.46*
Interaction: gender and perceived disapproval by peers of criminal behaviour		0.94**		
Interaction: gender and beliefs regarding traditional sex roles		1.02		
Interaction: gender and attitudes favouring criminal behaviour		1.01		
Interaction: gender and assaulted by others		1.02		
Interaction: gender and sexually assaulted		0.76		
Interaction: gender and physically assaulted by parent		0.91***		
n	7983	7983	3625	4358
LL (*df*)	-4093 (18)	-4078 (25)	-1035 (17)	-3020 (17)
BIC	8347	8371	2210	6073
χ^2 -Random Intercept	331***	315***	77***	237***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

[a]Simultaneous entry model has a BIC of 8,338.

[b]Pregnancy was examined among women, and it reduces the model's BIC and is not significant.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Summary of findings regarding the combination of measures of the life-course theories and women-specific measures used to explained serious criminal behaviour

Measures of each of the life-course theory combined with the women-specific measures improve the explanatory ability. Generally, the effects of the women-specific measures do not change when combined with measures of the life-course theories; however, some differences exist. Specifically, when perceived disapproval of criminal behaviour by

peers is included in models along with measures of the life-course theories, the gender differences in its effects are minimized. Put differently, the effect of this measure is now similar between women and men. In the combined Interactional Theory model, contrary to hypotheses, the effect of belief in traditional sex roles is no longer significant. The significant interactions with gender do change across each of the models, which was not expected. Generally, however, the interactions did not result in large differences in effects in the gender split models, which is generally contrary to the arguments regarding the need to include these measures explain the criminal behaviour of women. These measures aid in the explanation of the criminal behaviour of both men and women.

A brief examination of the combination models shows that the more dynamic a model is, the better it performs. Moreover, models that rely on rare behaviours tend not to be as explanatory as those models that include common behaviours. There is little difference in the effects of the measures in various combination models, and the majority of the findings either refuting or supporting hypotheses are maintained in these models. Although all the combination models show marked improvement in their ability to explain serious criminal behaviour, the significance of the chi-square value of the random intercepts in all these models suggests that a better model is possible and that additional variables may increase the explanatory power of the model.

Steps 2 and 3: Further Multivariate Extensions: Integrative Modeling and the Inclusion of Lagged Effects

As mentioned-above, several steps can be undertaken to best explain serious criminal behaviour over the life-course. Although some improvement is gained through the combination of individual life-course theories and women-specific measures, the significance of the chi-square value of the random intercept suggests that other models may still exist to better explain serious criminal behaviour over the life-course. This section focuses first on the development of an integrative model in which the most predictive measures of each of the life-course theories and the women-specific measures are combined. Then, in the next section, there is an examination of how lagged or previous behaviours have an impact on present serious criminal behaviour. Specifically, the lag effect of serious criminal behaviour is examined along with the lag effects of a few important independent variables.

Development of an integrative model to explain serious criminal behaviour

Given the overlap between the various life-course theories, a more integrative model may be better able to explain serious criminal behaviour than each proposed life-course theory separately. As before, model-building processes were followed. Measures were added to the model in the light of the bivariate BICs (with the exception of a handful of variables that are associated with relatively higher losses of observations), and they were retained only if they improved the overall BIC. Similar to previous models, gender interactions were examined as well; but, unlike in previous models, only two significant interactions are included: gender and physical assault by others, and gender and delinquent peers. Second, the difference in the magnitude of the effect of physical assault by others for women and men is minimal (1.02 vs. 1.01). The difference in the effect of delinquent peers is larger for women than for men; however, this difference does not merit the additional complexity of developing gender-specific models. The evidence in the split-models suggests that using a more integrative theory to explain serious criminal behaviour may remove the need to model or theorize about this behaviour differently by gender. Given this, only the model for all respondents (with no interactions) are discussed here (see Table 32). Notably, none of the measures from the Dual Taxonomy is included in the final model because the addition of these variables does not improve model fit and are non-significant in the integrative modelling context. This may be indicative of the significant overlap between several of the life-course theories.

In the integrative model, age and age^2 are no longer associated with criminal behaviour; yet, the effects of ethnicity and gender remain significant. Visible minorities are 39% more likely than Caucasians to report serious criminal behaviours over the life-course. Women are 54% less likely than men to report this behaviour. In examining the measures included from the General Theory of Crime – self-control and opportunity for criminal behaviour – some differences from previous models are noted. First, the opportunity for criminal behaviour is not significant, although its inclusion in the model improves the BIC. Self-control remains significantly related to criminal behaviour, although its effect is somewhat reduced from previous models (IRR: 1.18).

Table 32. An extended model of the measures of the Life-course Theories, women-specific measures, and self-reported serious criminal behaviour

	Model: No Interactions	Model: Gender Interactions	Women[a]	Men
	IRR	IRR	IRR	IRR
Age	0.91	0.92	0.62**	1.05
Age^2	0.998	0.998	1.01	0.995*
Ethnicity	1.39***	1.38**	1.97***	1.22
Gender	0.46***	0.15*	-	-
Perceived disapproval by peers of criminal behaviour	0.89***	0.90***	0.89***	0.89***
Beliefs regarding traditional sex roles	1.03*	1.01	1.04	1.02
Presence of delinquent peers	***	***	***	***
Few vs. none	1.48***	1.33**	1.87**	1.36*
Some vs. none	2.43***	1.98***	4.32***	2.01***
Attitudes favouring criminal behaviour	1.03*	1.03	1.02	1.02
Self-control	1.18**	1.18***	1.21***	1.17***
Opportunity for criminal behaviour	1.00	1.00	1.01	1.00
School involvement	0.92***	.92***	0.87**	0.93***
Physically assaulted by others	1.01***	1.01**	1.02*	1.01***
Parental attachment	0.98**	0.97**	0.99	0.98*
Presence of children	2.05*	2.42	2.25*	2.49
Interaction: Gender and perceived disapproval by peers of criminal behaviour	-	0.99		
Interaction: Gender and beliefs regarding traditional sex roles	-	1.04		
Interaction: Gender and attitudes favouring criminal behaviour	-	1.00		
Interaction: Gender and self-control	-	1.00		
Interaction: Gender and opportunity	-	1.00		
Interaction: Gender and assaulted by others	-	1.02*		
Interaction: Gender and parental attachment		1.03		
Interaction: Gender and children	-	0.82		
Interaction: Gender and delinquent peers	-	1.51***		
n	7622	7622	3624	3998
LL (*df*)	-3777 (18)	-3761 (27)	-1019 (17)	-2726(17)
BIC	7715	7764	2072	5592
χ^2 -Random Intercept	242***	236***	83***	161***

Note. None of the measures of Dual Taxonomy is included here because their inclusion does not improve model fit and are non-significant in the integrative modelling context; IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion;
[a]Pregnancy was examined among women, and it reduces the model's explanatory power and is not significant.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

With the exception of women-specific measures, the remaining measures included in the integrative model come from both the Age-graded Theory of Informal Social Control and the Interactional Theory. Respondents with a few and some delinquent peers are respectively 48% and 143% more likely to report criminal behaviour. Contrary to expectations, those with children are twice as likely as those who do not have children to

report serious criminal behaviours. Two of the other measures provide protection against criminal behaviour over the life-course. Increased involvement in school and parental attachment are both respectively associated with decreases in the likelihood of serious criminal behaviour (0.92 and 0.98).

Several of the women-specific measures are retained in the integrated model. Of these variables, beliefs regarding traditional sex roles, attitudes favouring criminal behaviour and physical assault by others are associated with increases in serious criminal behaviour. As endorsements of traditional sex roles and attitudes favouring criminal behaviour increase, there is a corresponding 3% increase in the likelihood of serious criminal behaviour. Each unit increase in physical assault by others corresponds to a 1% increase in the likelihood of criminal behaviour. Contrary to the effects of these women-specific measures, perceived disapproval of criminal behaviour by peers has a protective effect on criminal behaviour. Increases in perceived disapproval by peers correspond with an 11% decrease in the likelihood of serious criminal behaviour over the life-course.

The effects of all but one measure included in the model are consistent with the previously discussed hypotheses. The effect of the presence of children remains contrary to expectations. It was hypothesized that children would in fact be a protective factor against serious criminal behaviour, however, findings suggest that the presence of children is related to increases in the likelihood serious criminal behaviour.

Overall, this integrative model improves upon the previously examined models. It should be noted, however, that the BIC for this model is not lower than that of the combination model for Interactional Theory and women-specific measures (BIC: 7,142; RI: 256; # of Observations: 6,791). There are several reasons as to why the integrative model is considered stronger than the above-mentioned combination model. First, the larger BIC of the integrative model is related to the larger number of observations in this model compared to the combination model. Discarding the measures of physical assault by parents from the integrative model, which is not significant, actually increases the model's BIC by 558, and the number of observations by 555. The increase in the BIC can be attributed to the larger number of cases, which arguably increases the strength of the model beyond that of the combination (especially since the removed measure is non-significant). Secondly, the integrative model reduces the chi-square value of the random

intercept while also decreasing the model's degrees of freedom by two. The decrease in the chi-square value of the random intercept is a marked improvement upon the intercept associated with the combination model for Interactional Theory and women-specific measures. For these reasons, the integrative model appears to be a much better explanation of serious criminal behaviour over the life-course.[54] Yet, the proposed integrative model is not the best possible model to explain serious criminal behaviour. The chi-square value of the random intercept of the model remains significant.

As the chi-square value of the random intercept remained significant all through the current analyses, a question arises as to whether a fixed- or random-effects model is appropriate to explain serious criminal behaviour. The Hausman test assesses whether a fixed- or a random-effects model is preferred. This test was conducted for each of the models included to this point and the test showed that fixed-effects models were preferred in every instance. Thus, the random-effects modelling is maintained in order to further understand how the inclusion of lagged effects affects both the between- and within-person variance associated with serious criminal behaviour over the life-course because issues of endogeneity lagged effects cannot be used in fixed-effects models.

Examination of lagged effects on serious criminal behaviour

The inclusion of the lag of serious criminal behaviour greatly improves on the integrative model. Both the BIC and chi-square value of the random intercept show marked improvement (Integrative model: 7,715 and 242; Integrative Model with Lag: 7,372 and 170) (see Table 33). Few of the effects in the model change because of the inclusion of the lag of serious criminal behaviour, which suggests that the lag accounts for a unique portion of the variance. Furthermore, its inclusion is associated with an increased explanatory ability of the integrative model. Thus, those who reported serious criminal behaviour in the prior wave are 8% more likely than those who do not to report serious criminal behaviour in the most recent wave. Given that the first-order lag effect is

[54] A dichotomous variable, indicating whether a respondent was missing information was included in separate analyses. This variable was not significant in the multivariate context (unlike in bivariate analyses where it was associated with a lower likelihood of reporting serious criminal behaviours). Thus, those who attrited from the survey or did not respond to particular items in a wave were not in fact any more or less prone to criminal behaviour than those who responded, and missing information does not appear to have a dramatic impact on the outcome.

significant, we might also expect second- or third-order lag effects, but only a significant first-order is observed.

Table 33. Integrated model of self-reported serious criminal behaviour including a first-order lag effect for serious criminal behaviour

	Model: No Interactions IRR	Model: Gender Interactions IRR
Age	0.88	0.88
Age^2	1.00	1.00
Ethnicity	1.36**	1.35**
Gender	0.46***	0.32
Perceived disapproval by peers of criminal behaviour	0.90***	0.90***
Beliefs regarding traditional sex roles	1.03*	1.03*
Presence of delinquent peers	***	***
Few vs. none	1.44*	1.30*
Some vs. none	2.42***	1.99***
Attitudes favouring criminal behaviour	1.03*	1.02
Self-control	1.16***	1.17***
Opportunity for criminal behaviour	1.00	1.00
School involvement	0.93***	0.93***
Physically assaulted by others	1.01**	1.01**
Parental attachment	0.98**	0.97**
Presence of children	1.98*	1.83
First-order lag of serious criminal behaviour	1.08***	1.08***
Interaction: Gender and perceived disapproval by peers of criminal behaviour	-	0.98
Interaction: Gender and beliefs regarding traditional sex roles	-	1.00
Interaction: Gender and attitudes favouring criminal behaviour	-	1.00
Interaction: Gender and self-control	-	0.99
Interaction: Gender and opportunity	-	1.00
Interaction: Gender and assaulted by others	-	1.02
Interaction: Gender and parental attachment	-	1.03
Interaction: Gender and children	-	1.13
Interaction: Gender and delinquent peers	-	1.50***
n	7341	7341
LL (*df*)	-3602 (19)	-3587 (27)
BIC	7372	7414
χ^2 -Random Intercept	170***	160***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

As with previous examinations, a model including interactions with gender was examined. As with the integrative model without the lag, none of the gender interactions, excepting gender and delinquent peers, are significant, thus indicating no sufficient reason to examine split models by gender.

Although the model has significantly improved through the inclusion of first-order lag of serious criminal behaviour, the chi-square value of the random intercept

remains significant. The significance of this intercept suggests that there are still extra factors that must be included to explain the variance in serious criminal behaviour over the life-course. Given that many of the hypothesized factors in the literature to explain serious criminal behaviour are already included in the model, a final attempt is made to include lags of some of the relevant independent variables that may add to our ability to account for serious criminal behaviour over the life-course.

The lagged independent variables, whose effects are significant, are shown in Table 34. A first-order lag of both attitudes favouring criminal behaviour and involvement in school are significantly associated with serious criminal behaviour. Moreover, both first- and second-order lags of physical assault by others are also significant. In general, the inclusion of the significant lags of the independent variables has little effect on the majority of other measures included in the model.

The effects of both the first- and second-order lags of physical assault by others are as expected. Many argue that the effect of physical assault is enduring over time. The impact of each of its lags is the same as the simultaneous effect of physical assault. The effect of previous school involvement is protective against the likelihood of future serious criminal behaviour. Again, this finding is consistent with hypotheses regarding school involvement, and it is not surprising that involvement with school would have a lag effect. The first-order lag effect of attitudes favouring criminal behaviour is contrary to expectations. According to the lag effect, those with more pro-criminal attitudes in the previous wave are less likely to report serious criminal behaviour in the present wave.

Overall, the addition of the lags of the independent variables significantly improves the model. Both the BIC and the chi-square value of the random intercept have improved, although the chi-square value of the random intercept is not reduced to non-significance. Given the wide range of measures and the various modelling options utilized, the current model represents the best model to explain serious criminal behaviour over the life-course in the present study. In the case of modelling serious criminal behaviour, a random-effects model proves more helpful because of its ability to include lag effects, which have a dramatic ability to account for serious criminal behaviour over the life-course, while considering both between- and within-individual variation.

Table 34. Integrated model of self-reported serious criminal behaviour including a first- and second-order lag effects

	Model: No Interactions IRR
Age	0.97
Age^2	0.997
Ethnicity	1.37**
Gender	0.45***
Perceived disapproval by peers of criminal behaviour	0.89***
Beliefs regarding traditional sex roles	1.03*
Presence of delinquent peers	***
Few vs. none	1.47***
Some vs. none	2.51***
Attitudes favouring criminal behaviour	1.03*
Self-control	1.15***
Opportunity for criminal behaviour	0.99
School involvement	0.93***
Physically assaulted by others	1.01***
Parental attachment	0.97**
Presence of children	1.96*
First-order lag of serious criminal behaviour	1.11***
First-order lag of attitudes favouring criminal behaviour	0.97*
First-order lag of involvement of school	0.96**
First-order lag of physically assaulted by others	1.01***
Second-order lag of physically assaulted by others	1.01**
n	6963
LL (*df*)	-3367 (23)
BIC	6937
χ^2 -Random Intercept	127***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Summary of Findings Regarding Serious Criminal Behaviour over the Life-course

A summary of the large number of findings presented in this chapter addresses each of the original research questions. First, no life-course theory of criminal behaviour accounts equally well for the criminal behaviour of women and men over the life-course. The models built on two theories that rely predominantly on time-invariant measures do not perform as well as the models built on the two dynamic theories – Interactional Theory and the Age-graded Theory of Informal Social Control. Moreover, neither the General Theory of Crime nor the Dual Taxonomy theory is gender invariant as hypothesized. Yet, gender-specific models are not considered necessary with the Interactional Theory and the Age-graded Theory of Informal Social Control, which is contrary to a few of the proposed hypotheses regarding specific measures. Although many of the findings in this

chapter weakly support each of the life-course theories, the Interactional Theory does provide the best explanation of serious criminal behaviour and is gender invariant.

Second, the inclusion of women-specific measures not only accounts for a good portion of the variance in the outcome, it also increases the explanatory power of each life-course theory. Nevertheless, contrary to the hypotheses proposed in the present study, the inclusion of the women-specific measures does not greatly increase the ability to explain the serious criminal behaviour of women, but does add to the explanation of the serious criminal behaviour of men over the life-course.

Given these findings, a move to a more integrative model was undertaken. Findings suggest that this type of integrative model improves the ability to account for serious criminal behaviour over the life-course better than any of the previously examined models. Moreover, this more integrative model accounts for the criminal behaviour of women and men equally well and better than other mainstream theories examined in this study. The inclusion of lagged effects in the model provided the best model of serious criminal behaviour in suggesting that these types of effects must also be considered when explaining criminal behaviour.

Dependent Variable: Count of Self-reported Non-serious Criminal Behaviour

Generally, non-serious criminal behaviour is reported more often than serious criminal behaviour by both men and women across all waves of the survey (see Table 35). The means of non-serious criminal behaviours range from 0.42 to 0.61 for men and from 0.17 to 0.32 for women. The distribution of this variable is also highly positively skewed. As with serious criminal behaviour, the variance exceeds the mean. The mean number of non-serious criminal behaviours decreases slowly and steadily over time.[55] The decline in the means of non-serious criminal behaviours reported by men is fairly consistent across the waves. There is only one point at which there is a significant difference in the mean of reported behaviours (Wave 1: 0.57 vs. Wave 7: 0.42, $p < 0.01$). The initial decline in the self-reported criminal behaviour of women is quite large between Waves 1 and 2; yet, after Wave 3, the decline for women is consistent suggesting that women may desist from criminal behaviour at younger ages than men. This decrease is reflective of lower rates of

[55]Although the proportion of missing information increases across waves, the decline in the reported mean is not related to this increase. The mean number of non-serious criminal behaviours at any waves was not significantly different between those who responded at each wave and those who did not.

criminal behaviour as individuals age, as shown with the age-crime relationship in the literature. Again, women "age out" of criminal behaviour earlier than men.

As with serious criminal behaviour, the use of cohorts could be beneficial to control for any potential differences by age in propensity to commit crime. Although there are no notable differences in the mean number of self-reported non-serious criminal behaviours of women across age groups and waves, subtle but significant differences exist among men (see Appendix G, Table 8). For example, at age 15, men aged 11 and 12 in the first wave of the survey reported a mean of non-serious criminal behaviour lower than that of those aged 15 during the first wave (0.33 and 0.44 vs. 0.95, respectively). This evidence supports the use of cohorts as controls in the analyses.

Table 35. Mean number, 95% confidence interval, and test of gender differences for non-serious criminal behaviour among men and women

		Men (*n*=918)	Women (*n*=807)	F (df_1, df_2)
Wave 1	**Mean**	0.57	0.32	29.09***
	(95% CI)	(0.50-0.63)	(0.27-0.38)	(1, 1723)
	% Missing	0	0	
Wave 2	**Mean**	0.61	0.24	70.88***
	(95% CI)	(0.54-0.68)	(0.20-0.28)	(1, 1644)
	% Missing	4.2	4.1	
Wave 3	**Mean**	0.60	0.25	60.67***
	(95% CI)	(0.53-0.68)	(0.20-0.30)	(1, 1616)
	% Missing	6.2	5.5	
Wave 4	**Mean**	0.54	0.21	58.21***
	(95% CI)	(0.47-0.61)	(0.17-0.26)	(1, 1537)
	% Missing	12.3	8.7	
Wave 5	**Mean**	0.54	0.19	63.05***
	(95% CI)	(0.47-0.61)	(0.15-0.24)	(1, 1491)
	% Missing	14.7	11.9	
Wave 6	**Mean**	0.48	0.17	56.88***
	(95% CI)	(0.41-0.54)	(0.13-0.21)	(1, 1492)
	% Missing	16.1	10.0	
Wave 7	**Mean**	0.42	0.17	47.05***
	(95% CI)	(0.36-0.49)	(0.13-0.20)	(1, 1377)
	% Missing	23.7	15.5	

Note. CI= confidence interval; *df*=degrees of freedom.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Life-course Theory: a) General Theory of Crime

Bivariate relationships

As hypothesized, the bivariate analyses show that self-control and the opportunity for criminal behaviour are both related to non-serious criminal behaviour (see Table 36). With each unit increase, indicating a decrease in self-control, there is a 26% increase in the likelihood of non-serious criminal behaviour. Thus, those with the lowest levels of self-control are over 25 times more likely than those with the highest levels of self-control to report non-serious criminal behaviour (that is, $1.26^{14} = 25.4$). Likewise, increases in the opportunity for criminal behaviour are associated with increases of 5% in the likelihood of reporting non-serious criminal behaviour. On the other hand, as expected, parental attachment is negatively related to non-serious criminal behaviour. Increases in parental attachment are associated with 8% decrease in the likelihood of reporting non-serious criminal behaviour.

Table 36. Bivariate relationships between self-reported non-serious criminal behaviour and the measures of the General Theory of Crime

	IRR	Random Intercept (χ^2)	Number of Observations	LL(*df*)	BIC
Age	1.37***	2035***	10894	-7804 (4)	15645
Age^2	0.99***	2045***		-7796 (4)	15629
Cohort	1.17*	1980***	10894	-7829 (4)	15694
Ethnicity	0.87	1983***	10894	-7830 (4)	15696
Gender	0.39***	1697***	10894	-7757 (4)	15551
Self-control	1.26***	1089***	10894	-7605 (4)	15247
Opportunity for criminal behaviour	1.05***	1916***	10483	-7661 (4)	15359
Parental attachment	0.92***	1922***	10821	-7674 (4)	15384

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Each of the demographic variables was also related to non-serious criminal behaviour, with the exception of ethnicity. Age had a curvilinear relationship with non-serious criminal behaviour, which suggests that initially this type of behaviour increases with age until it peaks at age 14, after which point it begins to decline. As noted with serious criminal behaviour, cohort is also significantly related to non-serious criminal behaviour and again issues with multicollinearity arise when the measures of age and cohort are included in the same model. Thus, cohort is not included in further multivariate examinations of non-serious criminal behaviour. Women are 61% less likely

than men to report non-serious criminal behaviour. As previously discussed in the section examining serious criminal behaviour, the lack of significance of ethnicity presents a challenge because of its well-established relationship with criminal behaviour. Again, it is my intention to include this variable in the multivariate models of non-serious criminal behaviour until its inclusion considerably deteriorates the fit of the models.

In all of the bivariate analyses, the chi-square value of the random intercept is significant (see Table 36), which suggests considerable portions of variance left unexplained. The value for the random intercept associated with the measure of self-control is much lower than the chi-square value observed for the other bivariate models. Self-control accounts for a substantial portion of the unobserved heterogeneity in non-serious criminal behaviour.

Multivariate relationships

With the exception of ethnicity, all the factors highlighted in the General Theory of Crime and the demographic control variables are associated with non-serious criminal behaviour (see Table 37). Moreover, these associations are in expected directions. First, the relationship between age and non-serious criminal behaviour remains curvilinear, although diminished slightly. Second, only two of the measures are related to decreases in the likelihood of non-serious criminal behaviour over the life-course: gender and parental attachment. Women are 50% less likely than men to report non-serious criminal behaviour. Contrary to the argument that self-control and opportunity are the sole explanatory factors associated with criminal behaviour, increases in parental attachment are associated with 4% decreases in the likelihood of non-serious criminal behaviour. In line with hypotheses, the effects of self-control and opportunity are related to increases in the likelihood of this behaviour, although their effects are slightly reduced in this context.

Two other models, which contain several hypothesized interactions, are displayed in Table 37. As hypothesized, the interaction between self-control and opportunity is significant, however, its inclusion marginally increases the model BIC and is not considered an improvement. The final model in Table 37 examines the interaction effects between gender, self-control, opportunity, and parental attachment. None of these interactions is significant nor do they improve the model fit (model BIC actually increase). Taken as a whole, the application of the General Theory of Crime to non-

serious criminal behaviour appears to be gender invariant as hypothesized. It is not necessary to model these effects separately by gender.

The examination of model fit highlights the superiority of the multivariate model over the bivariate models (BIC: 14,627 vs. 15,247 to 15,696). Further examination of the chi-square values of the random intercept reveals that a significant amount of variation remains unexplained by the General Theory of Crime model, although the value is reduced by at least 50% from the bivariate models.

Table 37. Multivariate relationships between self-reported non-serious criminal behaviour and the measures of the General Theory of Crime

	Model: No Interactions IRR	Model: Interactions IRR	Model:Gender Interactions IRR
Age	1.19***	1.18***	1.19***
Age^2	0.994***	0.994***	0.994***
Ethnicity	0.89	0.89	0.90
Gender	0.50***	0.50***	0.68
Parental attachment	0.96***	0.96***	0.96*
Self-control	1.23***	1.27***	1.28***
Opportunity for criminal behaviour	1.03***	1.05***	1.05***
Interaction: Self-control and opportunity for criminal behaviour	-	0.996**	0.997**
Interaction: Gender and parental attachment	-	-	0.98
Interaction: Gender and self-control	-	-	0.96
Interaction: Gender and opportunity	-	-	1.00
Interaction: Gender and opportunity, and self-control	-	-	1.00
n	10776	10776	10776
LL (*df*)	-7267 (10)	-7263 (11)	-7258 (15)
BIC	14627	14628	14656
χ^2 -Random Intercept	845***	847***	853***

Note. IRR = Incidence-rate ratio; GTC = General Theory of Crime; n= number of observations included in the model; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Summary of the relationships between the General Theory of Crime measures and non-serious criminal behaviour

Overall, the relationships between the measures of the General Theory of Crime and non-serious criminal behaviour are significant and for the most part the effects are in the hypothesized directions. Both self-control and opportunity are associated with non-serious criminal behaviour. On the other hand, contrary to hypothesis, parental attachment remains inversely related to non-serious criminal behaviour, while controlling

for both self-control and opportunity. The evidence supports the hypothesis of gender invariance as implied by the General Theory of Crime.

Finally, the General Theory of Crime model accounts for a significant amount of variation in non-serious criminal behaviour over the life-course, while indicating that the inclusion of additional explanatory variables may be beneficial in explaining this behaviour. On the whole, this evidence provides support of the hypotheses outlined in the General Theory of Crime.

Life-course Theories: b) Interactional Theory

Bivariate relationships

The majority of the bivariate analyses are supportive of the hypotheses outlined in the Interactional Theory (see Table 38). Presence of children, objective parental attachment (time-varying), and conventional beliefs regarding the importance of school and marriage are all inversely related to likelihood of reporting non-serious criminal behaviour. Both marriage and the presence of children are respectively related to 40% and 33% decreases in the likelihood of non-serious criminal behaviour. As parental attachment increases, there are 3% decreases in likelihood of non-serious criminal behaviour. As the belief in the importance of school increases, there is a corresponding decrease of 14% in the likelihood of non-serious criminal behaviour.

Several of the measures of the Interactional Theory are related to increases in the likelihood of reporting non-serious criminal behaviour and some of these relationships support the original hypotheses of the theory. For example, the increases in the number of delinquent peers correspond with increases in the likelihood of non-serious criminal behaviour. Those with few delinquent peers and those with some delinquent peers are respectively 23% and 275% more likely than those without delinquent peers to report non-serious criminal behaviour. Moreover, as commitment to school decreases, there is a 7% increase in the likelihood of non-serious criminal behaviour. Respondents whose parents reported being on public assistance in the first wave of the survey are 53% more likely than respondents whose parents did not report being on public assistance in the first wave to report non-serious criminal behaviour. Conventional activities are also significantly related to non-serious criminal behaviour. Those who reported being in school only are 45% more likely than those who are neither in school nor working to

report non-serious criminal. Likewise, those who reported being involved in both school and work are 67% more likely than those who are neither in school or working to report non-serious criminal. Although these findings may appear to be contrary to original hypotheses, it is difficult to refute that this is the case without controlling for age. Further examination of this relationship occurs in the multivariate context.

Finally, conventional beliefs about the importance of working are not significant as hypothesized.

Table 38. Bivariate relationships between self-reported non-serious criminal behaviour and the measures of Interactional Theory

	IRR	Random Intercept (χ^2)	Number of Observations	LL(*df*)	BIC
Presence of children	0.67**	1789***	9459	-6727 (4)	13491
Parental attachment	0.97***	1489***	9307	-6716 (4)	13470
Presence of delinquent peers					
Few vs. none	1.23***	1021***	10785	-7290 (5)	14625
Some vs. none	3.75***				
Commitment to school	1.07***	1933***	10730	-7585 (4)	15207
Social class	1.53***	1921***	10699	-7640 (4)	15318
Conventional beliefs – Importance of school	0.86***	1959***	10832	-7703 (4)	15442
Conventional beliefs – Importance of work	1.02	2009***	10849	-7735 (4)	15508
Conventional activities					
School Only vs. neither	1.45**				
Work Only vs. neither	1.24	2055***	10888	-7743 (6)	15542
Both vs. neither	1.67***				
Marriage	0.60***	2008***	10893	-7800 (4)	15637

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The BICs for the bivariate models (13,491 to 15,637) are mostly similar, but in some cases lower than those seen for the variables of the General Theory of Crime and non-serious criminal behaviour (15,247 to 15,384). The chi-square of the random intercepts are similar to those seen for the General Theory of Crime. These two models appear to be accounting for similar amounts of unobserved heterogeneity, although significant portions of variance remain unexplained.

Multivariate relationships

In the multivariate model without interactions, the observed effects provide only weak support for the hypotheses of the Interactional Theory with only four of the nine original

hypotheses supported (see Table 39). The inclusions of the measures of ethnicity, social class, conventional beliefs in the importance of work, engaging in conventional activities, and marriage do not improve model fit and, thus, are excluded from the model.

The effect of age and gender are similar to previous models. The relationship between age and non-serious criminal behaviour remains curvilinear. Women are 53% less likely than men to report these behaviours.

Table 39. Multivariate relationships between self-reported non-serious criminal behaviour and the measures of Interactional Theory

	Model[a]: No Interactions IRR	Model[b]: Gender Interactions IRR
Age	1.24***	1.25***
Age^2	0.993***	0.993***
Gender	0.47***	0.52***
Presence of delinquent peers	***	***
Few vs. none	1.28***	1.28**
Some vs. none	3.59***	3.58***
Commitment to school	1.04**	1.04**
Conventional beliefs – Importance of school	0.91***	0.91***
Parental attachment	0.97***	0.97***
Presence of children	1.94**	2.63
Marriage	-	0.93
Interaction: Gender and parental attachment	-	0.99
Interaction: Gender and marriage	-	0.45
Interaction: Gender and children	-	0.67
n	7776	7681
LL (*df*)	-5156 (12)	-5153 (16)
BIC	10419	10449
χ^2 -Random Intercept	523***	523***

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
[a] Simultaneous Entry model's BIC is 10,560.
[b]Simultaneous Entry model's BIC is 10,352.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The measures of the Interactional Theory that remain in the multivariate models are in the expected directions, with the exception of the presence of children. Conventional beliefs in the importance of school and parental attachment are related to decreases in non-serious criminal behaviour. Increases in conventional beliefs in the importance of school and parental attachment are respectively related to 9% and 3% decreases in the likelihood of non-serious criminal behaviour. The remaining measures are related to increases in the likelihood of non-serious criminal behaviour and are relatively unchanged from their bivariate effects. Compared to respondents reporting no

delinquent peers, those respondents with few and those with some delinquent peers are respectively 28% and 259% more likely to report non-serious criminal behaviour. As commitment to school decreases, there is a 4% increase in the likelihood of non-serious criminal behaviour. Contrary to hypotheses, those with children are 94% more likely than those who do not have children to report non-serious criminal behaviour.

Contrary to expectations, none of the proposed interactions with gender are significant (see Table 39). Consequently, there is no statistical evidence to support modelling the Interactional Theory separately by gender.

Summary of the relationships between the measures of the Interactional Theory and non-serious criminal behaviour

Overall, the propositions of the Interactional Theory are weakly supported by the findings. About half of the hypotheses are not supported, because either the inclusion of the measure did not improve model fit or the relationship with non-serious criminal behaviour was not as expected. The inclusion of conventional activities, marriage, conventional beliefs in the importance of work, and social class do not improve the multivariate model; the presence of children increases in the likelihood of non-serious behaviour. As anticipated, parental attachment and conventional beliefs in the importance of school are related to decreases in the likelihood of non-serious criminal behaviour. Both the presence of delinquent peers and less commitment to school are related to increases in the likelihood of non-serious criminal behaviour, as hypothesized. Although not proposed in the original theory, none of the hypothesized interactions with gender is significant. On the whole, the lack of significance of several of the measures of the Interactional Theory and the unexpected relationship between the presence of children and non-serious criminal behaviour provide limited support of the full Interactional Theory in explaining non-serious criminal behaviour.

In comparison, the BIC of the multivariate model for the Interactional Theory is better than that of the multivariate model of the General Theory of Crime (10,419 vs. 14,627). This suggests that the measures in the Interactional Theory better account for the variation of non-serious criminal behaviour than the measures of the General Theory of Crime. Although the chi-square of the random intercept of this model is an improvement

over the chi-square value of the random intercept of the General Theory of Crime, the value remains significant suggesting that the model could be further improved.

Life-course Theories: c) Dual Taxonomy

Bivariate relationships

An examination of the bivariate relationships reveals several expected relationships between the variables proposed in the Dual Taxonomy and the likelihood of non-serious criminal behaviour (see Table 40). As expected in explaining non-serious or "adolescent-limited" criminal behaviour, neither parenting style nor neuropsychological deficits are significant. Although not contrary to an explicit hypothesis, the impact of parental deviance on non-serious criminal behaviour was not expected. Consistent with expectations, those respondents reporting non-delinquent peers, compared to those reporting delinquent peers, were 82% less likely to report non-serious criminal behaviour over the life-course. Although Moffitt notes that those without knowledge of delinquent peers should be less likely to commit crimes, she also hypothesizes that those who do not have peers would be non-deviants. The present bivariate relationship does not support this contention. The effect of having no peers is less than having non-delinquent peers.

Table 40. Bivariate relationships between self-reported non-serious criminal behaviour and the measures of Dual Taxonomy Theory

	IRR	Random Intercept (χ^2)	Number of Observations	LL(*df*)	BIC
Peer rejection and knowledge of delinquent peers					
No peers vs. delinquent peers	0.62***				
Non-delinquent peers vs. delinquent peers	0.18***	1581***	10785	-7497 (5)	15040
Parental deviance	1.06***	1854***	10587	-7531 (4)	15099
Parenting style					
Non-inductive vs. inductive	1.03	1946***	10683	-7645 (5)	15336
Semi-inductive vs. inductive	1.07				
Neuropsychological deficits	1.40	1953***	10728	-7664 (4)	15365

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The BICs of the bivariate models range from 15,040 to 15,365. These BICs, although consistent with those of the General Theory of Crime, are high relative to those for the Interactional Theory. The chi-square value of the random intercepts range from

1,581 to 1,953. Although this range overlaps with the previous models of non-serious criminal behaviour, they are among the highest values observed.

Multivariate relationships

An examination of the multivariate model reveals similar association between variables as the bivariate models. The results of the model with no interactions are focussed on here, as the inclusion of the hypothesized interaction between parental deviance (i.e., family adversity) and neuropsychological deficits is not significant (see Table 41). Consistent with the Dual Taxonomy, this interaction was not proposed to be significantly associated with non-serious or "adolescent-limited" criminal behaviour but rather with serious or "life-course-persistent" criminal behaviour. In examining the demographic variables, the curvilinear relationship between age and the likelihood of non-serious criminal behaviour persists. Women are 57% less likely than men to report non-serious behaviours. Ethnicity is excluded from the model because it affects model convergence.

Neuropsychological deficits are not related to the likelihood of non-serious criminal behaviour. Again, peer rejection and knowledge of delinquent peers is related to the likelihood of non-serious criminal behaviour. As previously noted, the significance in the measure of peer rejection and knowledge of delinquent peers simultaneously supports and refutes some of Moffitt's hypotheses. As proposed, respondents without delinquent peers are less likely to engage in non-serious criminal behaviours; nevertheless, those with no peers are not non-delinquents. It is more likely that this group represents the later proposed group of low-level chronics. The effect of parental deviance also remains similar in magnitude and significance in the multivariate context. Moreover, the continued relationship between parental deviance and the likelihood of non-serious criminal behaviour is not explicitly hypothesized in the Dual Taxonomy.

An examination of the BIC of the multivariate models indicates improvement in predictive ability over the other bivariate models. Moreover, the BIC of the multivariate model of the Dual Taxonomy is better than that of the BIC from the multivariate model of the General Theory of Crime (13,997 vs. 14,627); nonetheless, it is not as low as the BIC of the Interactional Theory model (10,419). The chi-square value of the random intercept of the multivariate model is also smaller than those of the bivariate models (1,292 vs. 1,581 to 1,953), suggesting an improvement in the ability of the multivariate

model to account for unobserved heterogeneity compared to the bivariate models. The chi-square value is similar to those observed for the multivariate models of the General Theory of Crime and Interactional Theory. All of the models indicate that significant portions of the unobserved heterogeneity remain unexplained.

Table 41. Multivariate relationships between self-reported non-serious criminal behaviour and the measures of Dual Taxonomy (DT)

	Model: No Interactions[a] IRR	Model: Interactions[b] IRR	Model:Gender Interactions[c] IRR
Age	1.35***	1.35***	1.35***
Age^2	0.991***	0.991***	0.991***
Gender	0.43***	0.43***	0.45***
Parental deviance	1.06***	1.06***	1.07***
Neuropsychological deficits	1.22	0.93	1.21
Peer rejection and knowledge of delinquent peers	***	***	***
No peers vs. delinquent peers	0.67***	0.68***	0.73***
Non-delinquent peers vs. delinquent peers	0.20***	0.20***	0.21***
Interaction: Neuropsychological deficits and parental deviance	-	1.09	-
Interaction: Gender and knowledge of delinquent peers		-	0.86*
n	10331	10331	10331
LL (*df*)	-6952 (10)	-6950 (11)	-6949 (11)
BIC	13997	14003	14000
χ^2 -Random Intercept	1292***	1280***	1296***

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
[a]Simultaneous entry models has a BIC of 14,011.
[b] The simultaneous entry model has a BIC of 14,026.
[c]The simultaneous entry model has a BIC of 14,014.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

As seen in Table 41, the significant interaction between peer rejection and the knowledge of delinquent peers and gender lends support to Moffitt's argument that women would be less likely than men to have delinquent peers and hence are less likely to engage in criminal behaviour. Models split by gender highlight how the measures of the Dual Taxonomy may differ by gender.

As seen in Table 42, age is significant for men only and its relationship with the likelihood of non-serious criminal behaviour is curvilinear. Among women and men, each unit increase in parental deviance corresponds respectively with a 9% and 5% increase in the likelihood of non-serious criminal behaviour over the life-course. The effect of peer rejection and knowledge of delinquent peers is larger for women than men.

Again, for both men and women, those with no peers are not abstaining from non-serious criminal behaviour. Notably, as in the bivariate models, neuropsychological deficits are not significant for men or women, which is consistent with hypotheses. All of these different effects by gender should be taken with caution, as only an interaction between gender and peer rejection and knowledge of delinquent peers is significant.

Table 42. Multivariate relationships between self-reported non-serious criminal behaviour and the measures of Dual Taxonomy by gender

	Women IRR	Men IRR
Age	1.07	1.51***
Age^2	0.997	0.989***
Parental deviance	1.09***	1.05***
Neuropsychological deficits	1.03	1.31
Peer rejection and knowledge of delinquent peers	***	***
No peers vs. delinquent peers	0.57***	0.72***
Non-delinquent peers vs. delinquent peers	0.18***	0.21***
n	4876	5455
LL (*df*)	-2324 (9)	-4610 (10)
BIC	4724	9298
χ^2 -Random Intercept	403***	885***

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Summary of the relationships between the Dual Taxonomy measures and non-serious criminal behaviour

Overall, the findings provide mixed support for the hypotheses of the Dual Taxonomy. First, in line with hypotheses, neuropsychological deficits are not predictive of non-serious criminal behaviour. The remainder of the findings are not strictly consistent with the taxonomy. The positive association between parental deviance and the likelihood of non-serious criminal behaviour was not explicitly hypothesized. Again, the relationship between criminal behaviour and peer rejection and knowledge of delinquent peers appears to be more complex than proposed by the Dual Taxonomy.

Overall, the model fit for the Dual Taxonomy is better than the General Theory of Crime, but worse than the Interactional Theory; nevertheless, this model has the least ability to account for the unobserved heterogeneity in non-serious criminal behaviour over the life-course. This evidence provides weak support for the hypotheses of the Dual Taxonomy as pertaining to non-serious criminal behaviour.

Life-course Theories: d) Age-graded Theory of Informal Social Control

Bivariate relationships

Several of the bivariate relationships with non-serious criminal behaviour and the measures proposed in the Age-graded Theory of Informal Social Control are as hypothesized (see Table 43). Early conduct disorder and incarceration are both positively associated with the likelihood of non-serious criminal behaviour. With each unit increase in the reported number of criminal behaviours before the age of 12, there is a corresponding 223% increase in the likelihood of reporting non-serious criminal behaviour. Those who report incarceration are 49% more likely to report non-serious criminal behaviour than those not reporting incarceration. The presence of delinquent peers is also predictive of non-serious criminal behaviours. Those with few or some delinquent peers are respectively 23% and 275% more likely than those with non-delinquent peers to report non-serious criminal behaviour. Those who report working are 11% more likely than those who do not report working to report non-serious criminal behaviour. Yet, when importance of work is examined, the overall measure is not significant, although those who reported that their job is not important are 15% more likely to report non-serious criminal behaviour than those without a job.

Some of the background factors are also predictive of increased likelihood of non-serious criminal behaviour. For example, those respondents whose parents endorsed the acceptability of at least one criminal behaviour by an adult (i.e., parental deviance) are 40% more likely than those whose parents do not endorse criminal behaviour of adults to report these behaviours. Lower social class respondents are 53% more likely than higher class respondents to report non-serious criminal behaviour. Respondents from one-parent households are 55% more likely than those from two-parent households to report non-serious criminal behaviour.

Only two of the measures exert a protective influence on the likelihood of non-serious criminal behaviour: parental attachment and being married. Increases in parental attachment correspond with 3% decreases in the likelihood of non-serious criminal. Those who are married are 40% less likely than those who are not married to report non-serious criminal behaviour.

Several of the findings are contrary to the expectations outlined in the theory. Non-serious criminal behaviour is not related to difficult temperament, parental disciplinary style, school involvement, parental rejection, importance of work. It was not possible to assess the relationship between marital attachment and non-serious criminal behaviour because of small numbers in a category.

Table 43. Bivariate relationships between self-reported non-serious criminal behaviour and the measures of the Age-graded Theory of Social Control

	IRR	Random Intercept (χ^2)	Number of Observations	LL(*df*)	BIC
Early conduct disorder	3.23***	1690***	9459	-6718 (4)	13472
Incarceration	1.49*	1751***	9459	-6731 (4)	13499
Presence of delinquent peers					
Few vs. none	1.23***	1021***	10785	-7290 (5)	14625
Some vs. none	3.75***				
Parental attachment	0.97***	1489***	9307	-6717 (4)	13470
Parental deviance	1.40***	1856***	10587	-7533 (4)	15102
Social class	1.53***	1921***	10699	-7640 (4)	15318
One parent household structure	1.55***	1909***	10699	-7639 (4)	15315
Difficult temperament	1.13	1947***	10692	-7646 (4)	15330
Parenting disciplinary style					
Non-inductive vs. inductive	1.03	1946***	10683	-7645 (4)	15336
Semi-inductive vs. inductive	1.07				
School involvement	1.01	1975***	10722	-7373 (4)	15383
Parental rejection	1.47	2000***	10828	-7708 (4)	15453
Working	1.11*	2002***	10888	-7768 (4)	15573
Marriage	0.60***	2008***	10893	-7800 (4)	15637
Number of siblings	1.03	1987***	10894	-7830 (4)	15697
Importance of work[a]					
Job not important vs. no job	1.15*	1796***	9160	-6375 (5)	12796
Job important vs. no job	1.09				
Marital attachment[b]	-	-	-	-	-

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

[a] Regression does not include Wave because this information was not collected at that time. Different reference categories were also examined; no significant differences between categories were observed.

[b] Bivariate analyses will not converge, there are two few cases in the category of "married and time with partner not important."

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

In terms of model fit, the BICs of the bivariate models range from 13,472 to 15,697. This range is consistent with those observed for the other models. Some BICs are lower than those seen with the previous models, however, this finding may be related to decreasing sample sizes associated with these measures rather than actual explanatory

power of the measure. The general range of the chi-square values of the random intercepts is from 1,021 to 2,008. This range is similar to previous models.

Multivariate relationships

As seen in Table 44, some hypotheses of the theory are supported by the results from the multivariate models. Similar to the models of serious criminal behaviour, it was not possible to include early conduct disorder or incarceration in the multivariate modelling, due to lack of variation in these measures and issues with model convergence, or ethnicity because of issues with convergence. Several other variables are not included in the final multivariate model because they do not improve fit of the model. These variables include: parental deviance, social class, one-parent household, difficult temperament, parental disciplinary style, parental rejection, employment status, marital status and number of siblings. The non-significance of these variables is contrary to several of the propositions of the theory.

In terms of demographic measures, both age and gender are related to the likelihood of non-serious criminal behaviour over the life-course. As previously observed, there is a curvilinear relationship between age and the likelihood of criminal behaviour. Women are 51% less likely than men to report this behaviour. Two of the remaining measures of the theory are inversely related to the likelihood of reporting non-serious criminal behaviour. As expected, as school involvement and parental attachment increase, there is a corresponding 6% and 4% decrease in the likelihood of non-serious criminal behaviour. Presence of delinquent peers, however, is associated with increases in the likelihood of non-serious criminal behaviour. Those who report few and some delinquent peers are respectively 28% and 268% more likely than those who report no delinquent peers to report criminal behaviour.

Three hypothesized interactions between gender, marriage, parental attachment and working were examined in the multivariate context and none of the interactions is significant. This finding is contrary to the hypotheses that marriage and parental attachment are more important to explaining the criminal behaviour of women and that work is expected to be more important in explaining this behaviour for men. Thus, split modelling by gender is not examined.

Finally, analyses were undertaken to examine the effect of job attachment on the likelihood of non-serious criminal behaviour. In the multivariate context, this measure was neither significant nor did its inclusion improve model fit.

Table 44. Multivariate relationships between self-reported non-serious criminal behaviour and the measures of Age-graded Theory of Social Control

	Model: No Interactions[a]	Model: Gender Interactions[b]
	IRR	IRR
Age	1.23***	1.23***
Age^2	0.993***	0.993***
Gender	0.49***	0.55***
Presence of delinquent peers	***	***
Few vs. none	1.28***	1.27***
Some vs. none	3.68***	3.66***
School involvement	0.94***	0.94***
Parental attachment	0.96***	0.97***
Marriage	-	0.38
Work	-	1.02
Interaction: Gender and parental attachment	-	0.99
Interaction: Gender and marriage	-	0.35
Interaction: Gender and work	-	0.99
n	9157	9157
LL (*df*)	-6170 (10)	-6167 (15)
BIC	12432	12472
χ^2 -Random Intercept	593***	586***

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
[a]The simultaneous entry model has a BIC of 12,062.
[b]The simultaneous entry model has a BIC of 12,084.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Overall, the model fit for the final model examining the theory is consistent with previous models. Comparatively, this model performs better than the models for both the General Theory of Crime and the Dual Taxonomy; nevertheless, the Interactional Theory model is superior. This pattern is also observed for the chi-square values associated with the random intercepts. The chi-square values, however, remains significant.

Summary of the relationships between the Age-graded Theory of Informal Social Control measures and non-serious criminal behaviour

The majority of the measures proposed in this theory are not associated with non-serious criminal behaviour, although conclusions could not be drawn regarding early conduct disorder and incarceration because of the rarity of these events among women. The measures improving fit included the following: presence of delinquent peers, involvement

in school and parental attachment. The effect of each of these measures is consistent with the hypotheses of the theory. Notably, each of the measures is time-varying rather than time-invariant. No interactions with gender are significant suggesting that the theory is gender invariant in its application to non-serious criminal behaviour.

Taken as a whole, the measures of the model fit are in the range of the models previously examined in this section; nevertheless, the findings generally provide weak support for the theory as a whole.

Additional factors theorized to account for the criminal behaviour of women: Women-specific measures

Bivariate relationships

Several of the variables argued to be important in explaining the criminal behaviour of women were examined in relation to their effects on the likelihood of non-serious criminal behaviour over the life-course. Contrary to hypotheses, there is no association between pregnancy and the likelihood of non-serious criminal behaviour among women, and being assaulted by parent was also not significant for the full sample. As hypothesized, increases in both perceived disapproval of peers and parents are respectively associated with 16% and 8% decreases in the likelihood of criminal behaviour. The remaining measures were associated with increases in the likelihood of non-serious criminal behaviour. As the endorsement of traditional sex roles increases, there is a corresponding 3% increase in the likelihood of criminal behaviour. Increases in attitudes favouring criminal behaviour are associated with 17% increases in the likelihood of criminal behaviour. Each unit increase in being assaulted by others and sex assault measures are respectively related to 0.4% and 8% increases in the likelihood of non-serious criminal behaviour over the life-course.

The BIC for the bivariate model ranged from 14,592 to 15,566, with the exception of pregnancy for which the BIC of the bivariate model was 5,370. The chi-square value of the random intercept remains significant in all of the models indicating additional factors are needed to explain the likelihood of non-serious criminal behaviour.

Table 45. Bivariate relationships between self-reported non-serious criminal behaviour and additional women-specific measures

	IRR	Random Intercept (χ^2)	Number of Observations	LL(*df*)	BIC
Assaulted by parent	1.00	1744***	10183	-7277 (4)	14592
Perceived disapproval by peers of criminal behaviour	0.84***	1175***	10809	-7372 (4)	14782
Beliefs regarding traditional sex roles	1.03*	1980***	10602	-7549 (4)	15134
Attitudes favouring criminal behaviour	1.17***	1437***	10877	-7575 (4)	15187
Perceived disapproval by parents of criminal behaviour	0.92***	1915***	10871	-7729 (4)	15495
Assaulted by others	1.004***	2006***	10888	-7764 (4)	15566
Sexually assaulted	1.08**	2006***	10883	-7759 (4)	15555
Pregnancy[a]	0.86	561***	5192	-2268 (4)	5370

Note. IRR = Incidence-rate ratio. LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
[a]Analyses conducted with women only.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Multivariate relationships

All of the women-specific measures were included in a multivariate model without interactions, and a second model assessed the interactions between gender and all of the women-specific measures (see Table 46). Overall, the multivariate model (BIC: 13,141) is an improvement over the bivariate models. The chi-square value associated with the random intercept is significantly reduced from the bivariate models, in most cases by at least 50%. Most of the associations between the women-specific variables and the likelihood of non-serious criminal behaviour are as expected. A curvilinear relationship with age exists. Women are 48% less likely than men to report non-serious criminal behaviour. As attitudes favouring criminal behaviour increase, there is an 8% increase in the likelihood of non-serious criminal behaviour. Unit increases in sexual and physical assaults by others are respectively related to 7% and 1% increases in the likelihood of non-serious criminal behaviour. Only perceived disapproval of criminal behaviour by peers is related to decreases in the likelihood of criminal behaviour (13% reduction). Contrary to expectations, ethnicity, beliefs in traditional sex roles, physical assaults by parents and disapproval of parents are not associated with the likelihood of non-serious criminal behaviour and did not improve fit. Given that some of the gender interactions are significant, attention is given to the genders-specific models (see Table 47).

Little support for the women-specific hypotheses is found in the split models. First, only two of the measures interact with gender: experiencing physical assault by a parent and perceived disapproval of criminal behaviour by peers. Each unit increase in physical assault by parents is associated with a 6% increase in the likelihood of non-serious criminal behaviour among men only. Increases in perceived disapproval of criminal behavior by peers are associated with decreases in the likelihood of non-serious criminal behaviour (women: -15%; men: -12%).

Table 46. Multivariate relationships between self-reported non-serious criminal behaviour and additional women-specific variables

	Model: No Interactions[a, b] IRR	Model: Gender Interactions IRR
Age	1.21***	1.21***
Age^2	0.994***	0.994***
Gender	0.52***	0.51
Perceived disapproval by peers of criminal behaviour	0.87***	0.88***
Beliefs regarding traditional sex roles	0.98	0.99
Attitudes favouring criminal behaviour	1.08***	1.08***
Perceived disapproval by parents of criminal behaviour	1.02	1.01
Sexually assaulted	1.07**	1.08*
Physically assaulted by others	1.01***	1.01**
Physically assaulted by parents	1.00	1.05*
Interaction: Physically assaulted by parents and gender	-	0.96*
Interaction: Perceived disapproval by peers of criminal behaviour and gender	-	0.96*
Interaction: Belief regarding traditional sex roles and gender	-	0.98
Interaction: Attitudes favouring criminal behaviour and gender	-	1.01
Interaction: Perceived disapproval by parents of criminal Behaviour and gender	-	1.05
Interaction: Assaulted by others and gender	-	1.00
Interaction: Sexually assaulted and gender	-	0.97
n	9809	9809
LL (*df*)	-6510 (13)	-6502 (20)
BIC	13141	13187
χ^2 -Random Intercept	828***	802***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; Bayesian Information Criterion.

[a]The simultaneous entry model had a BIC of 13,143.

[b]Pregnancy was examined among women, and it reduces the model's explanatory power and is not significant.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Although some gender differences are noted when examining the gender split models, the majority are not significant and therefore should be considered with caution. Many of the measures of assault are significant only for men (Table 47). Among women,

as endorsement of traditional sex roles increases, there is a corresponding 4% decrease in the likelihood of non-serious criminal behaviour, as hypothesized. Contrary to hypotheses, perceived disapproval by parents is actually associated with increases in the likelihood of non-serious criminal behaviour. As perceived disapproval by parents increases among women, there is a corresponding 5% increase in the likelihood of criminal behaviour.

Table 47. Multivariate relationships between additional women-specific variables and self-reported non-serious criminal behaviour

	Women IRR	Women IRR	Men IRR
Age	1.02	1.02	1.32***
Age^2	0.998	0.998	0.992**
Perceived disapproval by peers of criminal behaviour	0.85***	0.85***	0.88***
Beliefs regarding traditional sex roles	0.96*	0.96*	0.99
Attitudes favouring criminal behaviour	1.09***	1.08***	1.09***
Perceived disapproval by parents of criminal behaviour	1.05*	1.05*	1.01
Physically assaulted by others	1.004**	1.004**	1.01**
Sexually assaulted	1.05	1.05	1.08*
Physically assaulted by parents	1.00	1.00	1.06*
Pregnancy	-	1.08	
N	4700	4700	5109
LL (*df*)	-2230 (12)	-2229 (13)	-4258 (12)
BIC	4561	4569	8620
χ^2 -Random Intercept	265***	264***	552***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

There is a significant decrease in the BICs and chi-square values associated with the random intercept compared to the main effects models. This finding is mostly related to the decrease in the number of observations in each of the split models compared to the main effects models. Like previous models, the BIC for the women's model is smaller than that for the men's model, likely representing the smaller variance of non-serious criminal behaviour among women compared to men. In comparison with the split models of the Dual Taxonomy, the BIC, and the chi-square value of the random intercept are lower in the women-specific split models, although these chi-square values remain significant suggesting that the inclusion of additional variables may be beneficial.

Summary of the relationships between women-specific measures and non-serious criminal behaviour.

Some of the proposed associations between the women-specific measures and the likelihood of non-serious criminal behaviour are not significant. Of the associations that are significant, only two of the relationships support the hypotheses that these measures are more important in explaining the criminal behaviour of women than men. In direct opposition to the hypotheses, physical assault by parent and sexual assault are significant predictors of the likelihood of non-serious criminal behaviour only among men. Finally, the effects of the remaining women-specific measures are similar for both men and women. These findings provide little support for the women-specific arguments in explaining criminal behaviour over the life-course. Yet, they do account for some of the variance in the likelihood of non-serious criminal behaviour of men and women. Overall, the main effects model is in the range of other models and provides a limited explanation of non-serious criminal behaviour; nonetheless, the gender-specific models are contrary to most hypotheses.

Summary of Findings of all Theories Used to Explain Non-Serious Criminal Behaviour

Similar to the findings for serious criminal behaviour, the effects of the measures of the various life-course theories are generally not as hypothesized (see Table 48). Many of the hypothesized measures do not achieve significance, and in some instances the effects are actually in the opposite direction of the hypothesis. All theories performed relatively weakly in explaining non-serious criminal behaviour. Again, the significance of parental attachment while controlling for self-control and opportunity and the inverse relationship between the interaction effect between self-control and opportunity and the likelihood of non-serious behaviours are both contrary to the hypotheses of the General Theory of Crime. Although the effects of parental attachment, conventional beliefs in school, presence of delinquent peers and school commitment were as expected, the unexpected positive effects of the presence of children and the lack of significance of the remaining measures of the Interactional Theory provide limited support to the full Interactional Theory in explaining non-serious criminal behaviour. The majority of the findings for the measures of the Dual Taxonomy are non-significant, and these findings are consistent with the hypotheses. Only the findings for the effect of parental deviance were not as

expected, but no hypotheses were proposed explicitly for this association with non-serious criminal behaviour. The findings relating to abstention from criminal behaviour and peer rejection are possibly more complex than originally proposed by Moffitt. All the background factors and some of the central measures of the Age-graded Theory of Informal Social Control are not included in the final modelling of non-serious criminal behaviour as they do not improve the fit of the model. Finally, the majority of the hypothesized effects of the women-specific measures are contrary to many of the hypotheses regarding their role in the explanation of the criminal behaviour of women.

The ratio of significant to non-significant measures and/or measures with effects in opposition with hypotheses are lowest for the General Theory of Crime and the Dual Taxonomy and higher for the Age-graded Theory of Social Control and the Interactional Theory; nevertheless, there are significantly fewer hypotheses tested in the former two theories. Overall, the evidence for each of the theories is rather weak.

Only two of the five sets of models examined provided evidence suggesting that gender-specific modelling may be necessary. Although there are differences in the effects of the measures of the Dual Taxonomy by gender, these differences are relatively small and provide support for the gender invariance argument instead of gender-specific modelling. Moreover, as mentioned above, some of the effects of the women-specific measures are similar for men and women. This evidence suggests that gender-specific modelling may not be significant even in the face of the significant gender interactions.

Like the findings for serious criminal behaviour, the measures of model fit are better for some of the models compared to others. Accordingly, the BIC of the Interactional Theory provided the best fit of all of the models examined, followed by the Age-graded Theory of Informal Social Control, the model examining women-specific measures, the Dual Taxonomy, and lastly, the General Theory of Crime. Like the BICs, the chi-square values associated with the random intercepts also vary by each theory, with the measures of the Interactional Theory accounting best and while the measures of the Dual Taxonomy accounting the worst for the unobserved heterogeneity. Regardless of model fit, all of the models have significant chi-square values associated with their random intercepts, which suggests that additional variables could be useful in explaining non-serious criminal behaviour.

Table 48. Summary of support for the life-course theories

Theory and Measures	Hypotheses Support	Gender Invariance Hypothesis Support	Theory Support
General Theory of Crime			
Parental attachment	Mixed	✓ no gender interactions tested	WEAK
Self-control	✓		
Opportunity for criminal behaviour	✓		
Interaction: Self-control & opportunity	×		
Interactional Theory			
Presence of children	×	✓ no gender interactions tested	WEAK
Parental attachment	✓		
Presence of delinquent peers	✓		
Commitment to school	✓		
Social class	× NS		
Conventional beliefs – Importance of School	✓		
Conventional beliefs – Importance of Work	× NS		
Conventional activities	× NS		
Marriage	× NS		
Dual Taxonomy			
Parental deviance (PD)	×	✓	WEAK
Neuropsychological deficits	✓	✓	
Peer rejection and knowledge of delinquent peers	✓	✓	
Parental disciplinary style (PDS)	✓	-	
Interaction: Neuropsychological deficits & PD	✓	-	
Interaction: Neuropsychological deficits & PDS	✓	-	
Age-graded Theory of Informal Social Control			
Early conduct disorder	✓	✓ no gender interactions tested	WEAK
Incarceration	✓		
Parental attachment	✓		
Parental deviance	✓		
Presence of delinquent peers	✓		
School involvement	✓		
Social class	× NS		
One parent household structure	× NS		
Parenting disciplinary style	× NS		
Difficult temperament	× NS		
Parental rejection	× NS		
Working	× NS		
Marriage	× NS		
Number of siblings	× NS		
Importance of work	× NS		
Marital attachment	-		
Women-specific measures			
Assaulted by parent	× NS	✓	LITTLE SUPPORT FOR GENDER-SPECIFIC HYPOTHESES
Perceived disapproval by peers of criminal behaviour	✓	✓	
Beliefs regarding traditional sex roles	× NS	✓	
Attitudes favouring criminal behaviour	✓	✓	
Perceived disapproval by parents of criminal behaviour	× NS	×	
Assaulted by others	✓	✓	
Sexually assaulted	✓	×	
Pregnancy	× NS	-	

Note. ✓ In line with hypotheses; × Significant and in opposite direction of hypothesis; × NS – against hypotheses because association it not significant; Mixed – provides some evidence for one or more hypotheses; - not tested.

As undertaken with serious criminal behaviour, the following additional models are examined to further explain non-serious criminal behaviour over the life-course: 1) the combination of each of the proposed life-course theories with the women-specific measures, and examine if the chi-square values associated with the random intercepts remain significant; 2) combination of all of the measures examined in the present study to build the best fitting model of non-serious criminal behavior and assess the value of the random intercept; and 3) an examination of how the lag effects of previous criminal and other behaviours in the past may be related to present criminal behaviour.

Step 1: Multivariate Extensions of the Life-course Theories and the Women-specific Measures

This section explores the effects of individual measures in each of the life-course theories while including the effects of women-specific measures. In total, four models are examined for each of the theories: 1) main effects model for all respondents, 2) model with gender interactions for all respondents, 3) main effects model for women, and 4) main effects model for men. In cases where gendered interactions are significant, the focus will be on the split models.

The General Theory of Crime and Women-specific measures

The combination of the measures of the General Theory of Crime and women-specific measures is an improvement over either individual model in predicting non-serious criminal behaviour over the life-course (see Table 49; BIC of the General Theory of Crime: 14,627; BIC of women-specific measures: 13,141; BIC of the combined model: 12,677). The chi-square associated with the random intercept (RI) of the combined model also indicates an improvement in the combined model to account for the unobserved heterogeneity in non-serious criminal behaviour over the individual models (RI of the General Theory of Crime: 845; RI of women-specific measures: 828; RI of the combined model: 503). In addition to these improvements, two gender interactions are significant suggesting that gender-specific modelling may be advantageous in understanding how non-serious criminal behaviour may differ by gender over the life-course.

Table 49. An extended model of the General Theory of Crime, women-specific measures and self-reported non-serious criminal behaviour

	Model: No Interactions[a]	Model: Gender Interactions	Women[b]	Men
	IRR	**IRR**	**IRR**	**IRR**
Age	1.10	1.11***	0.93	1.20**
Age^2	0.997***	0.996**	1.00	0.995***
Gender	0.61***	0.60	-	-
Physically Assaulted by parents	1.00	1.04*	1.00	1.05***
Perceived Disapproval by peers of criminal behaviour	0.88***	0.89***	0.87***	0.89***
Beliefs regarding traditional sex roles	0.98	0.98	0.98	0.99
Attitudes favouring criminal behaviour	1.07***	1.06***	1.07**	1.06***
Self-control	1.17***	1.17***	1.19***	1.16***
Opportunity for criminal behaviour	1.03***	1.03***	1.04***	1.03***
Parental attachment	0.98*	0.99	0.96*	0.99
Perceived Disapproval by parents of criminal behaviour	1.01	1.00	1.04	1.01
Physically assaulted by others	1.004***	1.01**	1.004**	1.01***
Sexually assaulted	1.07*	1.08*	1.03	1.08***
Interaction: Gender and physically assaulted by parents	-	0.96*	-	-
Interaction: Gender and perceived disapproval by peers of criminal behaviour	-	0.97*	-	-
Interaction: Gender and belief regarding traditional sex roles	-	1.00	-	-
Interaction: Gender and attitudes favouring criminal behaviour	-	0.97	-	-
Interaction: Gender and self-control	-	1.00	-	-
Interaction: Gender and opportunity	-	1.02	-	-
Interaction: Gender and parental attachment	-	0.98	-	-
Interaction: Gender and perceived disapproval by parents of criminal behaviour		1.03		
Interaction: Gender and physically assaulted by others	-	1.00	-	-
Interaction: Gender and sexually assaulted	-	0.96	-	-
n	9722	9722	4656	5066
LL (*df*)	-6265 (16)	-6254 (26)	-2143 (15)	-4099 (15)
BIC	12677	12751	4413	8325
χ^2 -Random Intercept	503***	492**	219***	295***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
[a]Simultaneous Entry Model BIC is 12,683.
[b]Pregnancy was examined among women, and it reduces the model's explanatory power and is not significant.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Generally, the effects of most of the measures in the combined models remain similar to those observed in the individual models. There are two notable differences. First, the interaction between opportunity and self-control no longer improves the model and therefore is not included in the modelling. Second, parental attachment is significant only among women for non-serious criminal behaviour, although this difference was not associated with a significant gender interaction.

Overall, the combination of these two sets of measures indicates an improvement in the explanatory power of this model; nevertheless, the chi-square value of the random intercept could still be improved upon.

The Interactional Theory and Women-specific measures

The addition of the significant women-specific measures to the Interactional Theory Model (see Table 50) improves upon both of the individual models (Interactional Theory BIC: 10,419; Women-specific measures BIC: 13,141; combined model BIC: 9,170). The chi-square of this particular random intercept (RI: 335) is also an improvement over both models individually compared to the other model observed in this section. (Interactional Theory RI: 523; Women-specific measures RI: 828; Combined General Theory of Crime and women-specific measures RI: 503). Yet, the chi-square associated with the random intercept remains significant. One gender interaction is significant, although there is very little difference between women and men in the effect of parental attachment in models split by gender. The majority of the measures in the combined main effects models have effects similar to those noted in the individual models. Likely due to a reduction in sample size, several of the previously significant measures become non-significant in the combined models split by gender.

Similar to the previously combined model of General Theory of the Crime and the women-specific measures, the combination of the Interactional Theory and the women-specific measures improves the ability to predict the likelihood of non-serious criminal behaviour over the life-course. Further improvements to this model are possible as evidenced by the significant chi-square value associated with the random intercept.

Table 50. An extended model of the Interactional Theory, women-specific measures and self-reported non-serious criminal behaviour

	Model: No Interactions[a]	Model: Gender Interactions	Women[b]	Men
	IRR	IRR	IRR	IRR
Age	1.17**	1.18**	0.98	1.29***
Age^2	0.995**	0.995**	0.999	0.993***
Gender	0.57***	0.63	-	-
Presence of children	1.63*	1.46	2.18**	1.30
Parental attachment	0.98***	0.98**	0.97**	0.98*
Physically assaulted by parent	1.00	1.07**	1.00	1.07**
Perceived Disapproval by peers of criminal behaviour	0.89***	0.90***	0.89***	0.90***
Beliefs regarding traditional sex roles	0.98	0.99	0.96	0.99
Presence of delinquent peers				
Few vs. none	1.33***	1.33***	1.79***	1.16
Some vs. none	3.13***	3.12***	5.04***	2.49***
Commitment to school	1.02	1.02	1.02	1.01
Attitudes favouring criminal behaviour	1.06***	1.06***	1.05*	1.06***
Perceived Disapproval by parents of criminal behaviour	1.00	0.99	1.03	1.00
Conventional beliefs – Importance of school	0.96	0.96	0.97	0.95
Sexually assaulted	1.10*	1.52	1.07	1.59
Interaction: Gender and physically assaulted by parent	-	0.94**	-	-
Interaction: Gender and perceived disapproval by peers of criminal behaviour	-	0.96	-	-
Interaction: Gender and beliefs regarding traditional sex roles	-	0.98	-	-
Interaction: Gender and attitudes favouring criminal behaviour	-	1.00	-	-
Interaction: Gender and perceived disapproval by parents of criminal behaviour	-	1.04	-	-
Interaction: Gender and sexually assaulted	-	0.71	-	-
Interaction: Gender and presence of children	-	1.17	-	-
Interaction: Gender and parental attachment	-	1.00	-	-
n	7037	7037	3361	3676
LL (*df*)	-4441 (18)	-4498 (26)	-1532 (17)	-2948 (17)
BIC	9170	9226	3202	6036
χ^2 -Random Intercept	335***	320***	100***	228***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

[a]Simultaneous entry model has a BIC of 9,087.

[b]Pregnancy was examined among women, and it reduces the model's explanatory power and is not significant.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The Dual Taxonomy and Women-specific measures

The combination of the measures of the Dual Taxonomy and the women-specific measures (see Table 51) has a better ability to account for non-serious criminal behavior over the life-course than the individual models (Dual Taxonomy BIC: 13,997; Women-specific measures BIC: 13,141; Combined model BIC: 12,336). This combination model is better than the one with the measures of General Theory of Crime, but worse than the model combining the women-specific measures with the measures of the Interactional Theory. As with previous models, the chi-square associated with the random intercept decreases (RI: 672) but remains significant and much larger than the other models of combined measures (General Theory of Crime and women-specific model RI: 503; Interactional Theory and women-specific model RI: 335).

Generally, the majority of the effects for the specific measures do not change significantly from the individual models; nevertheless, there are a few notable differences between the individual models compared to this combined model. First, due to issues with convergence it is not possible to include the measure for neuropsychological differences in the models; in previous modelling of non-serious criminal behaviour this measure was non-significant. Second, two gender interactions are significant indicating that models split by gender may be advantageous. In the split models, these interactions point to differing effects of physical assault by parents and physical assault by others. Physical assault by parents increases the likelihood of non-serious criminal behaviour only among men. The effect for physical assault by others on the likelihood of non-serious criminal behaviour is larger for women (5%) than for men (1%). Due to issues with model convergence, the measure for beliefs in traditional sex roles is excluded from the split model for men.

Table 51. An extended model of the Dual Taxonomy, women-specific measures and self-reported serious criminal behaviour

	Model: No Interactions[a]	Model: Gender Interactions	Women[b]	Men
	IRR	IRR	IRR	IRR
Age	1.18***	1.20***	0.97	1.33***
Age^2	0.995***	0.995***	1.00	0.992***
Gender	0.56***	0.50	-	
Physically assaulted by parents	1.00	1.05**	1.00	1.06**
Perceived disapproval by peers of criminal behaviour	0.88***	0.89***	0.87***	0.89***
Beliefs regarding traditional sex roles	0.99	1.00	0.98	-
Parental deviance	1.04***	1.04***	1.05**	1.03*
Attitudes favouring criminal behaviour	1.07***	1.07***	1.08***	1.07***
Knowledge of delinquent peers				
No peers vs. delinquent peers	0.68***	0.72***	0.63***	0.71***
Non-delinquent peers vs. delinquent peers	0.24***	0.24***	0.21***	0.26***
Perceived disapproval by parents of criminal behaviour	1.02	1.01	1.04	1.01
Assaulted by others	1.01***	1.01**	1.05***	1.01***
Sexually assaulted	1.06*	1.06	1.04	1.06
Interaction: Gender and knowledge of delinquent peers	-	0.92	-	-
Interaction: Gender and physically assaulted by parents	-	0.95*	-	-
Interaction: Gender and perceived disapproval by peers of criminal behaviour	-	0.97	-	-
Interaction: Gender and belief regarding traditional sex roles	-	0.98	-	-
Interaction: Gender and attitudes favouring criminal behaviour	-	1.01	-	-
Interaction: Gender and perceived disapproval by parents of criminal		1.02	-	-
Interaction: Gender and assaulted by others	-	1.05***	-	-
Interaction: Gender and sexually assaulted	-	0.98	-	-
n	9460	94660	4493	5110
LL (*df*)	-6095 (16)	-5955 (24)	-1984 (15)	-4179 (14)
BIC	12336	12357	4171	8478
χ^2 -Random Intercept	672***	659***	205***	462***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

[a]Simultaneous entry model has a BIC of 12,114.

[b]Pregnancy was examined among women, and it reduces the model's BIC is not significant.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The Age-graded Theory of Informal Social Control and Women-specific measures

The combination of the Age-graded Theory of Informal Social Control and women-specific measures provides a more powerful explanation of non-serious criminal behaviour over the life-course than either set of measures individually (see Table 52). The combined model's BIC is 10,395, which is an improvement over each of the individual models. It outperforms other combination models examined here with the exception of the model that combines women-specific measures and Interactional Theory (BIC: 9,170). As with previous findings, the chi-square value of the random intercept remains significant, although it is greatly reduced from the value associated with either of the individual models (RI: 339). Only the chi-square value associated with the random intercept with the combined Interactional Theory and the women-specific measures is slightly lower (RI: 335).

The combination of the women-specific and the Age-graded Theory of Informal Social Control measures has similar effects as their addition to previous models. Generally, the effects of the measures included in the combined models are similar to the effects noted in the individual model. It is possible to maintain the measure for parental deviance in the combined model unlike in the case of the Age-graded Theory of Informal Social Control. Yet, it was not possible to maintain this measure in the split model for men. Taken as a whole, a better explanatory model for non-serious criminal behaviour over the life-course is possible given that the chi-square value of the random intercept remains significant.

Table 52. An extended model of the Age-graded Theory of Social Control, women-specific measures and self-reported non-serious criminal behaviour

	Model: No Interactions	Model: Gender Interactions	Women	Men
	IRR	**IRR**	**IRR**	**IRR**
Age	1.16*	1.18**	1.05	1.26**
Age^2	0.995**	0.994**	0.996	0.993*
Gender	0.58***	0.72	-	-
Parental attachment	0.98***	0.98***	0.97*	0.98*
Physically assaulted by parent	1.00	1.08***	1.00	1.09***
Perceived disapproval by peers of criminal behaviour	0.89***	0.90***	0.88	0.90***
Beliefs regarding traditional sex roles	0.99	1.00	0.98	1.00
Parental deviance	1.26***	1.25***	1.22	-
Presence of delinquent peers				
Few vs. none	1.31***	1.30***	1.62***	1.19*
Some vs. none	2.99***	2.98***	4.12***	2.69***
Attitudes favouring criminal behaviour	1.06***	1.05***	1.05*	1.05***
School involvement	0.97*	0.97*	0.94*	0.98
Physically assaulted by others	1.01***	1.01**	1.05**	1.01**
Perceived disapproval by parents of criminal behaviour	1.00	1.01	1.03	1.00
Interaction: gender and perceived disapproval by peers of criminal behaviour	-	0.96*	-	-
Interaction: gender and beliefs regarding traditional sex roles	-	0.98	-	-
Interaction: gender and attitudes favouring criminal behaviour	-	1.01	-	-
Interaction: gender and assaulted by others	-	1.04	-	-
Interaction: gender and perceived disapproval by parents of criminal behaviour		1.03	-	-
Interaction: gender and physically assaulted by parent	-	0.93**	-	-
n	7971	7971	3621	4417
LL (*df*)	-5121 (17)	-5105 (23)	-1596 (16)	-3573 (15)
BIC	10395	10416	3322	7272
χ^2 -Random Intercept	339***	322***	105***	230***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

. [a]Simultaneous entry model has a BIC of 10,370.

[b]Pregnancy was examined among women, and it reduces the model's BIC and is not significant.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Summary of findings regarding the combination of measures of the life-course theories and women-specific measures used to explained non-serious criminal behaviour

Each of the models combining the women-specific measures and the measures of each of the life-course theories improves the ability to explain non-serious criminal behaviour over the life-course. An examination of the combination models shows that the more

dynamic measures are included in a model, the better it is at explaining non-serious criminal behaviour. Theories that include measures capturing relatively rare events in the population are not typically as powerful as those that capture more common behaviours. There is little difference in the effects of the measures in the various combination models, and the majority of findings either refuting or supporting hypotheses are maintained in these models. The majority of individual effects for the measures in the combined models decreased slightly but generally remained unchanged. Notably, the measures of the Interactional Theory of commitment to school and conventional beliefs in the importance of school are no longer significant when combined with women-specific measures.

Although all of the combination models are marked improvements over their individual counterparts in predicting the likelihood of non-serious criminal behaviour, the significance of the chi-square value of the random intercepts in all of these models indicate that better models are possible.

Steps 2 and 3: Further Multivariate Extensions: Integrative Modeling and the Inclusion of Lagged Effects

This section focuses on the development of an integrative model in which the most predictive aspect of each of the life-course theories and the women-specific measures are combined, and then extends the integrative model to examine the role of previous behaviours (i.e., lag effects). In particular, the lag effect of non-serious criminal behaviour is examined along with the lag effects of important independent variables.

Development of an integrated model to explain non-serious criminal behaviour

An integrative model including measures from the various life-course theories and women-specific measures may provide a better explanation of non-serious criminal behaviour over the life-course than the individual theories themselves. Model-building was undertaken and measures were added to the model from lowest to highest BIC (with the exception of some measures that were associated with relatively fewer observations than others; these measures were entered last). Measures were only retained if the BIC for the model improved. In addition to these measures, gender interactions were examined in the next stage of modelling. Three of the gender interactions are significant: gender and presence of delinquent peers, gender and physical assault by others, and gender and physical assault by parents (see Table 53). The gender differences in the effects of

delinquent peers and physical assault by others are larger for women than for men. Nevertheless, the magnitude of these differences may not merit the added complexity of modelling non-serious criminal behavior separately by gender. In addition to this, the lack of significance in the effect of physical assault by parents in the case of women, which is contrary to proposed hypotheses, may also not indicate that gender-specific modelling is necessary. Given that the majority of effects are of similar magnitude and significance (with one exception of physical assault by parents) for men and women, the focus here is on the main effects model. Nonetheless, unlike with the integrative model for serious criminal behaviour, the final models in which lag effects are examined are split by gender.

In the integrative model, the curvilinear relationship between age and the likelihood of non-serious criminal behaviour remains. Women are 42% less likely than men to report non-serious criminal behaviour. The effects of many of the measures are similar to those noted in the individual models. Moreover, with the exception of the non-significance of beliefs in traditional sex roles, all of the measures included in the integrated model are consistent with proposed hypotheses. None of the measures of the Dual Taxonomy or the General Theory of Crime was retained in the integrative model for non-serious criminal behaviour. The exclusion of self-control is notably contrary to the hypotheses of the General Theory of Crime.

Overall, the integrative model is considered an improvement over all of the models, although the BIC is not lower than the BICs of the Interactional Theory or the Age-graded Theory of Informal Social Control when combined with the women-specific measures (Interactional Theory and women-specific model BIC: 9,170, RI: 335, # of Observations: 7,037; Age-graded Theory of Informal Social Control and women-specific BIC: 10,395, RI: 339, # of Observations: 7,971). Like the models of serious criminal behaviour, there are several reasons that a model with a higher BIC could be considered a better model than a model with a lower BIC. For example, the removal of the non-significant measure of the presence of children increases the number of observations by nearly 1,000 while increasing the model BIC by 1,237. Retaining more cases while removing a non-significant measure ensures the model is generalizable to more cases and can be considered an improvement to the model. The chi-square value of the random

intercept of the integrative model is similar to those in the other models as well. For these reasons, the integrative model[56] is used in further modelling.

Table 53. An extended model of the measures of the Life-course Theories, women-specific measures, and self-reported non-serious criminal behaviour

	Model: No Interactions	Model: Gender Interactions	Women[a]	Men
	IRR	IRR	IRR	IRR
Age	1.18**	1.20**	1.05	1.28***
Age^2	0.994***	0.994**	0.997	0.993***
Gender	0.58***	0.38***	-	-
Perceived disapproval by peers of criminal behaviour	0.90***	0.90***	0.89***	0.90***
Beliefs regarding traditional sex roles	0.99	0.99	0.97	1.00
Presence of delinquent peers				
Few vs. none	1.31***	1.21**	1.69***	1.20*
Some vs. none	3.13***	2.66***	4.67***	2.68***
Attitudes favouring criminal behaviour	1.06***	1.06***	1.04	1.06***
Commitment to school	1.03*	1.03*	1.03	1.03
School involvement	0.97*	0.97***	0.95	0.98
Physically assaulted by others	1.01***	1.01**	1.04***	1.01**
Parental attachment	0.98***	0.98**	0.97*	0.98**
Sexually assaulted	1.10*	1.09*	1.09	1.14
Physically assaulted by parents	1.004*	1.09***	1.00	1.09***
Interaction: Gender and assaulted by others	-	1.03***		
Interaction: Gender and delinquent peers	-	1.37***		
Interaction: Gender and assaulted by parents	-	0.92***		
n	8073	8073	3715	4358
LL (*df*)	-5175 (17)	-5153 (20)	-1648 (16)	-3496 (16)
BIC	10502	10486	3428	7125
χ^2 -Random Intercept	345***	335***	116***	223***

Note. None of the measures of Dual Taxonomy or the General Theory of Crime is included here because their inclusion does not improve model fit and are non-significant in the integrated modelling context. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

[a]Pregnancy was examined among women, and it reduces the model's BIC and is not significant.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Similar to the models of serious criminal behaviour, the chi-square value of the random intercept remains significant throughout the modelling of non-serious criminal behaviour. Again, the Hausman test was conducted for all models to assess whether a

[56] A dichotomous variable indicating whether a respondent was missing infromation on any of the measures in the final integrated modelwas included in separate analyses. This variable was not significant in the multivariate context, although it was in the bivariate analyses. In bivariate analyses, non-response is associated with a lower likelihood of reporting non-serious criminal behaviour. Therefore, those who did not respond at later waves were no more or less likely to report non-serious criminal behaviours. Missing information does not appear to have an impact on the outcome examined here.

fixed- or random-effect model is preferred. The fixed-effects models were preferred in all cases; nevertheless, further analyses make use of the random-effects modelling in an attempt to better understand how the inclusion of lag effects affects both between- and within-person variation in non-serious criminal behaviour over the life-course.

Examination of lagged effects on non-serious criminal behaviour

This section examines the lagged effects of non-serious criminal behaviour first and then the lagged effects of some of the independent variables in the integrative model for all of the respondents, women and men separately.

The inclusion of the lagged variables of non-serious criminal behaviour improves on the integrated model (see Table 56). Both the first- and second-order lag of non-serious criminal behaviour are significant (unlike the model for serious criminal behaviour where only the first-order lag was significant). Both the BIC and chi-square value of the random intercept decrease greatly between the two models (BIC: 10,502 vs. 9,600 and RI: 345 vs. 83). With the exception of age, the inclusion of the lagged effects does not affect the significance of the other measures. Moreover, their inclusion only slightly reduced the effects of other measures in the model suggesting that the first- and second-order lags account for a unique portion of the variance associated with the unobserved heterogeneity of the likelihood of non-serious criminal behaviour. Those who reported non-serious criminal behaviour in the prior wave are 19% more likely to report criminal behaviour in the succeeding wave than those who did not to report non-serious criminal behaviour. In addition, those who reported non-serious criminal behaviour consecutively over two waves are 2% more likely to report criminal behaviour in the current wave than those who did not report.

Again, similarly to the integrated model without lags, a handful of gender interactions are significant, suggesting that the gender-specific model may be advantageous in understanding how the effects of certain measures differ by gender. These four interactions - gender and delinquent peers, gender and physical assault by others, gender and physical assault by parents, gender and a first-order lag of non-serious criminal behaviour - are discussed specifically in regard to how they differ between men and women. As previously noted, there are only minor differences in the magnitude of the effects of delinquent peers, physical assault by others, and the first-order lag of non-

serious criminal behaviour. The effects of these measures are larger for women than for men, whereas effect of physical assault by parents is significant only among men. Each unit increase in experiencing physical assault by a parent corresponds with a 9% increase in the likelihood of non-serious criminal behaviour of men.

Table 56. Integrated model of self-reported serious criminal behaviour including first- and second-order lag effect for non-serious criminal behaviour

	Model: No Interactions	Model: Gender Interactions	Women[a]	Men
	IRR	**IRR**	**IRR**	**IRR**
Age	1.12	1.14*	0.92	1.21*
Age^2	0.996**	0.995*	1.00	0.994**
Gender	0.63***	0.41*	-	-
Perceived disapproval by peers of criminal behaviour	0.90***	0.90***	0.90***	0.90***
Beliefs regarding traditional sex roles	0.99	0.99	0.97	1.00
Presence of delinquent peers				
Few vs. None	1.27**	1.19*	1.56**	1.17
Some vs. None	3.03***	2.64***	4.14***	2.67***
Attitudes favouring criminal behaviour	1.06***	1.05***	1.04	1.05***
Commitment to school	1.02	1.02	1.02	1.01
School involvement	0.99	1.00	0.97	0.98
Physically assaulted by others	1.01**	1.01*	1.03***	1.01*
Parental attachment	0.98***	0.98**	0.97*	0.98*
Sexually assaulted	1.08*	1.07	1.08	1.08
Physically assaulted by parents	1.004*	1.08***	1.00	1.09***
First-order lag of non-serious criminal behaviour	1.19***	1.17***	1.22***	1.17***
Second-order lag of non-serious criminal behaviour	1.02*	1.03	1.11*	1.04
Interaction: Gender and assaulted by others	-	1.03***		
Interaction: Gender and delinquent peers	-	1.30***		
Interaction: Gender and assaulted by parents	-	0.93**		
Interaction: Gender and First-order lag of non-serious criminal behaviour		1.12**		
n	7414	7414	3469	3999
LL (*df*)	-4716 (19)	-4692 (23)	-1509 (18)	-3193 (18)
BIC	9600	9590	3165	6535
χ^2 -Random Intercept	83***	67***	29***	41***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.
[a]Pregnancy was examined among women, and it reduces the model's BIC and is not significant.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The improvement in the models with the first- and second-order lag effects of non-serious criminal behaviour is marked. Not only are the lag model's BICs lower than the integrated model's BICs, there is a dramatic reduction in the chi-square value of the

random intercept for the models. The large decrease in the chi-square value suggests that past history accounts for a substantial portion of the unobserved heterogeneity of the likelihood of non-serious criminal behaviour. A final attempt to explain the remaining variance in the random intercept (or the unobserved heterogeneity) is made through the inclusion of other lag measures (see Table 57).

Overall, the effects of most of the measures remain unchanged with the inclusion of first-order lags of some of the theorized measures. The effect of the first-order lags of presence of delinquent peers and the involvement in school are as expected. Previous attachment to delinquent peers increases the likelihood of non-serious criminal behaviour. Moreover, former involvement in school is protective against future non-serious criminal behaviour. However, the first-order lag of attitudes favouring criminal behaviour is contrary to expectations.

The addition of these lag effects significantly improves both the BIC and the chi-square value of the random intercept of the model. Within the measures examined, this current model represents the best model to explain non-serious criminal behaviour. As with the modelling of serious criminal behaviour, the use of a random-effects model proves advantageous in the modelling of non-serious criminal behaviour.

Table 57. Integrated model of self-reported non-serious criminal behaviour including lag effects of criminal behaviour as well as of a few other measures

	Model: No Interaction	Model: Gender Interactions	Women[a]	Men
	IRR	IRR	IRR	IRR
Age	1.16*	1.17*	1.04	1.25**
Age^2	0.995**	0.995**	0.996	0.994**
Gender	0.62***	0.43***	-	
Perceived disapproval by peers of criminal behaviour	0.90***	0.90***	0.89***	0.91***
Beliefs regarding traditional sex roles	0.99	0.99	0.97	1.00
Presence of delinquent peers	***	***	***	
Few vs. none	1.23**	1.16*	1.38*	1.17
Some vs. none	2.83***	2.54***	3.45***	2.62***
Attitudes favouring criminal behaviour	1.06***	1.06***	1.04	1.06***
Commitment to school	1.01	1.01	1.02	1.01
School involvement	0.99	0.99	0.97	1.00***
Physically assaulted by others	1.01**	1.01**	1.03***	1.01*
Parental attachment	0.98**	0.98**	0.97*	0.98**
Sexually assaulted	1.08*	1.07**	1.07	1.11
Physically assaulted by parents	1.004*	1.08**	1.00	1.09***
First-order lag of non-serious criminal behaviour	1.19***	1.18***	1.23***	1.19***
Second-order lag of non-serious criminal behaviour	1.06**	1.06**	1.11*	1.04
First-order lag of presence of delinquent peers	***	**	***	
Few vs. none	1.13	1.11	1.45**	1.01
Some vs. none	1.29***	1.25**	1.59**	1.14
First-order lag of involvement in school	0.96**	0.96**	0.94**	0.97*
First-order lag of attitude favouring criminal behaviour	0.97**	0.97**	0.95**	0.97*
Interaction: Gender and assaulted by others	-	1.03***	-	-
Interaction: Gender and delinquent peers	-	1.24**	-	-
Interaction: Gender and assaulted by parents	-	0.93**	-	-
Interaction: Gender and First-order lag of non-serious criminal behaviour	-	1.13*	-	-
n	7231	7231	3338	3893
LL (*df*)	-4558 (23)	-4543 (26)	-1435 (22)	-3093 (22)
BIC	9321	9317	3049	6367
χ^2 -Random Intercept	58***	45***	23***	25***

Note. IRR = Incidence-rate ratio; LL= Log-likelihood; *df* = degrees of freedom; BIC = Bayesian Information Criterion.

[a]Pregnancy was examined among women, and it reduces the model's BIC and is not significant.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Summary of Findings Regarding Non-Serious Criminal Behaviour Over Life-course

A brief summary of the large number of findings regarding non-serious criminal behaviour will address each of the original research questions. First, unlike the models for serious criminal behaviour, the proposed life-course theories account for the criminal

behaviour of men and women equally well (i.e., there is no need for gender-specific modelling with these individual models), although the findings provide weak support of the examined theories. The models, which rely mostly on dynamic measures such as the Age-graded Theory of Informal Social Control and the Interactional Theory perform better than those focusing on mainly static measures such as the General Theory of Crime or the Dual Taxonomy. The Interactional Theory does provide the best explanation of non-serious criminal behaviour.

Secondly, and consistent with hypotheses, the inclusion of women-specific measures not only accounts for a good portion of the variance in non-serious criminal behaviour, it also increases the explanatory power of each life-course theory. Yet, the introduction of the women-specific measures required more complex modelling and the findings suggest that models split by gender may be advantageous in understanding non-serious criminal behaviour over the life-course. Nevertheless, contrary to the hypotheses proposed in the present study, the inclusion of the women-specific measures does not greatly increase the ability to explain the non-serious criminal behaviour of women, but does improve the explanation of the non-serious criminal behaviour of men over the life-course. Although the explanatory power of the life-course theories was increased, the chi-square values of the random intercepts remain significant.

Based on these findings, an integrated model was developed. The integrated model further improved upon our ability to predict non-serious criminal behaviour. Unlike the findings for serious criminal behaviour, there was some evidence of differences by gender in the effect of measures on the likelihood of non-serious criminal behaviour over the life-course. The inclusion of lagged effects in the model provided the best model of non-serious criminal behaviour in the present study suggesting that these types of effects must also be considered when explaining criminal behaviour.

Summary of Findings Regarding Serious and Non-Serious Criminal Behaviour Over Life-course

The findings for the two dependent variables are quite similar. In total, nine of the measures examined have similar effects on the likelihood of serious and non-serious criminal behaviour. The models examining both types of criminal behaviour are improved by the inclusion of the women-specific measures. Ethnicity, beliefs about

traditional sex roles, self-control and the presence of children were associated with the likelihood of serious criminal behaviour only; whereas, commitment to school, experiencing sexual assault and physical assault by a parent were associated with the likelihood of non-serious criminal behaviour only. There is some evidence that gender-specific modelling may be beneficial but not necessary in the case of non-serious criminal behaviour. Overall, the models of both types of criminal behaviour produce similar evidence regarding each of the research questions and hypotheses.

CHAPTER 4: DISCUSSION AND CONCLUSION

In this chapter, there are five subsections focusing on each of the original research questions and hypotheses. Within these sections, the current findings are related to the body of literature. In addition to these five sections, there are three subsections that consider the overall contributions and implications of the current study with regard to theory, research methods, and policy.

Research Question and Hypothesis 1[57]

In this section, the findings for each of the theories are assessed in light of the current body of literature and against the original hypotheses.

General Theory of Crime

As hypothesized in the General Theory of Crime, the findings regarding criminal behaviour are similar regardless of type of criminal behaviour. This finding supports Gottfredson and Hirschi's (1990) argument that it is not necessary to have varying theories of criminal behaviour that are specific to the gravity of the crime. In addition to this finding, as proposed by Gottfredson and Hirschi (1990), decreasing self-control and increasing opportunities for criminal behaviour are predictive of increases in both serious and non-serious criminal behaviour. These findings are in line with the majority of studies examining the effects of the General Theory of Crime. Of the 83 previously mentioned studies, 80 noted at least a weak negative association between self-control and criminal behaviour (see Appendix A). The inclusion of self-control accounts for large portions of the unobserved heterogeneity in criminal behaviour, as previously noted by Paternoster and Brame (1997). Self-control may represent a "frailty" that plays a notable role in the prediction of criminal behaviour. Of the studies that included a measure of

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[57] *Research Question 1:* Do the proposed theories account equally well for the criminal behaviour of both men and women over the life-course?
Hypothesis 1: Based on the literature, it is hypothesized that the Dual Taxonomy applies to the criminal behaviour of men and women equally. It is also expected that overall the Interactional Theory and the Age-graded Theory of Informal Social Control account similarly for the criminal behaviour of men and women; however, it is also expected that the relative importance of proposed constructs will vary by gender. For example, family will be a more important source of informal social control for women and work will be more important for men. Finally, it is expected that gender will affect the outcomes of the General Theory of Crime. Based on the evidence in previous studies, it is expected that the effect of self-control will explain more of the criminal behaviour of men than women.

opportunity, most also noted a positive relationship between opportunity and criminal behaviour (for example see Cretacci 2008; Chapple and Hope 2003; Pratt and Cullen 2000; Lagrange and Silverman 1998; Longshore 1998; Grasmick 1993).

The remainder of the findings are contrary to many of the proposed hypotheses arising from the General Theory of Crime. First, the significant relationship between subjective parental attachment and criminal behaviour varied little and remained significant in the presence of both of the measures of self-control and opportunity. This finding is in direct opposition to original hypotheses, and some previous studies note this (see Jones et al. 2007; McCartan and Gunnison 2007; Blackwell and Piquero 2005; Cochran et al. 1998; Brownfield and Sorensen 1993). This evidence suggests that self-control and opportunity may not be the sole or the primary explanatory factors in accounting for criminal behaviour as argued by Gottfredson and Hirschi (1990).

Second, the interaction between self-control and opportunity did not add significantly to the explanation of criminal behaviour nor was its effect in the hypothesized direction. Although Sellers (1999) has noted the non-significance of this interaction, the effect being in the opposing direction than hypothesized has not previously been reported. The uniqueness of this finding may be related to an imperfect operationalization of opportunity in the current study. Amount of time spent with friends after school, in the evenings, and on weekends was used to measure opportunity and appeared to be an ideal measure of opportunity because time with friends tends to be unsupervised and can be related to involvement in criminal behaviour (Osgood, Wilson, O'Malley, Bachman and Johnston 1996). Nonetheless, the unexpected finding may suggest that a simple measure of time with friends may not be adequate to tap the complex concept of opportunity. For example, the measure may have provided more intuitive findings if it also captured whether the time was unsupervised and/or unstructured or if the friends had delinquent influences. Studies examining these complexities show that time with prosocial or less delinquent peers (Wright and Cullen 2004) and also time spent in supervised and structured activities (Osgood, Anderson and Shaffer 2005) decrease criminal behaviour. Although the unexpected finding may be related to the measure of opportunity, the interaction did not add significantly to the model and provides another mark against the General Theory of Crime.

Finally, the General Theory of Crime was gender invariant for non-serious criminal behaviour, but the evidence was not as straightforward in the case of serious criminal behaviour. In the case of serious criminal behaviour, the significance of the interaction between parental attachment and gender was the impetus for splitting the model by gender. Yet, once the model was split by gender, the gender difference in the magnitude of the effect of the various measures was minimal. Arguably, the findings could be assessed as being trivially different, and in this case, the present findings provide evidence supporting the propositions of the General Theory of Crime and contrary to the first hypothesis that the theory is gender invariant. This study adds to the body of evidence suggesting that the theory is gender invariant (see Appendix A - over half of the studies found gender invariance).

Overall, the model based on the General Theory of Crime performed the worst among all the models examined and its explanatory power is weak. This result is not surprising given that over half of the studies reviewed here also provide only weak support of the theory (see Appendix A). Nevertheless, self-control accounts for the largest portion of unobserved heterogeneity in serious criminal behaviour and the second largest in non-serious criminal behaviour, which is quite notable. This finding can be taken as strong evidence of the importance of criminal propensity in explaining criminal behaviour. Moreover, the importance of this measure also highlights the need to always consider between-individual variation and issues regarding population heterogeneity rather than removing this variation by only examining fixed-effects or within-individual effects. Although the findings of the present study are similar to many previous studies conducted on this theory, they do highlight the importance of simultaneously understanding the impact of both between- and within-individual effects (i.e., population heterogeneity vs. state dependence).

Interactional Theory

The major findings for the Interactional Theory are similar for both serious and non-serious criminal behaviour. Only a handful of the findings were consistent with the propositions of the theory. First, as found in previous research (see Jang 1999; Krohn et al. 1996; Thornberry et al. 1991), objective parental attachment is related to decreases in criminal behaviour. Moreover, as hypothesized, and in agreement with the findings of

previous research, the presence of delinquent friends (see Mears and Field 2002; Jang 1999; Thornberry et al. 1998; Matsueda and Anderson 1998; Thornberry et al. 1994; Lawrence 1991) and less commitment to school (see Thornberry et al. 2003; Jang 1999; Lawrence 1991; Thornberry et al. 1991) are both related to increases in the likelihood of criminal behaviour. Social class is predictive only of serious criminal behaviour and not of non-serious criminal behaviour, although the relationship between social class and criminal behavior has often been found to be non-significant when examining self-reported behaviour (see Elliott and Ageton 1980). Although previous research has not examined the impact of the conventional beliefs in the importance of school, the present study found a protective influence of this measure on criminal behaviour, as Thornberry hypothesized in the development of the Interactional Theory.

The effects of the remaining measures based on the Interactional Theory are contrary to its original hypotheses. First, the inclusion of several of the proposed measures did not improve model fit; conventional activities, marriage, and conventional beliefs in the importance of work do not improve the multivariate models of criminal behaviour. This lack of significance has not been previously noted as none of the research using the Interactional Theory has examined these measures. Nevertheless, the findings of the present study suggest that the many variables that are argued to be important in explaining criminal behaviour according to the Interactional Theory are not. It is possible that these measures, which predominantly focus on various types of social attachment, are not necessary in predicting criminal behaviour. It may be that the inclusion of the measures of parental attachment or attachment to delinquent peers accounts for the majority of the "social attachment" variance in criminal behaviour. Thus, a more parsimonious version of the Interactional Theory may not need to include these additional measures of social attachment.

Second, the presence of children was related to increased likelihood of criminal behaviour, which is contrary to the propositions of the Interactional Theory. This measure has not been examined specifically with regard to the Interactional Theory and, as such, is a unique finding. Nonetheless, a handful of studies have provided mixed results regarding the impact of children on criminal behaviour. Consistent with expectations, some studies have found that individuals were less likely to recidivate if children were

present (for example see Giordano et al. 2002; Uggen and Kruttschnitt 1998). On the other hand, Warr (1998) and Uggen et al. (2000) find that the presence of children has no additional impact on criminal behaviour beyond the effect of marriage. Finally, Massoglia and Uggen (2007) found that although those with children were more likely to desist from criminal behaviour than those without, the presence of children actually decreased chances of desistance among those with long arrest records. They argue that parenthood may in fact increase the urge to partake in economic crimes for subsistence. Furthermore, it is possible that the typical social attachment argument used to argue the protective effect of the presence of children is incorrect and that a self-control argument may better account for this relationship between children and criminal behaviour. Gottfredson and Hirschi (1990) indirectly argue that the presence of children can be used as a proxy for self-control. Those with low self-control may also practice risky sexual behaviours that are more likely to lead to procreation, hence the apparent positive relationship between presence of children and the likelihood of criminal behaviour. This relationship between having children and criminal behaviour should be investigated more thoroughly to understand the ways in which children may increase or decrease participation in criminal behaviour. On the whole, the original hypotheses of the Interactional Theory are weakly supported by the findings in the current study as in much of the literature (see Appendix B).

With regard to the first hypothesis of the current study, the Interactional Theory did account for the criminal behaviour of men and women in a similar manner. Although a handful of gender-specific hypotheses were proposed after the original theory was examined, none of these hypothesized interactions is significant and the relative importance of these measures does not vary by gender; nevertheless, the Interactional Theory is gender invariant as proposed in the main hypothesis. While these gender differences have been generally hypothesized about (see Giordano et al. 2002), little research has focussed on these gender differences. Some studies suggest that parental attachment may be different by gender (Jang and Smith 1997). Although none of the previous studies examining the Interactional Theory examined the effects of marriage on criminal behaviour, there is some evidence contrary to the current thinking, suggesting that the importance of this measure may be different for men and women (for example

see Bersani et al. 2009; King et al. 2007). This previous evidence taken in conjunction with current findings suggests that the proposed effects of marriage within the Interactional Theory should be studied further. The findings of the current study add to the body of literature noting no differences in these effects by gender.

Even with only a handful of the proposed variables aiding significantly to the explanation of criminal behaviour, the models examining the Interactional Theory have the most explanatory power of any of the models examining the individual life-course theories. On the whole, the present study adds to a small body of literature indicating weak support of the whole Interactional Theory, but at the same time documents the rather impressive explanatory power of certain measures included in the theory.

Dual Taxonomy

Unlike the three other theories examined in the current study, the effects of the measures based on the Dual Taxonomy theory should vary depending on the type of criminal behaviour examined, with serious criminal behaviour being akin to life-course-persistent criminal behaviour and non-serious criminal behaviour being more representative adolescent-limited criminal behaviour. Taking this into consideration, there are several findings in the current study that support the propositions of the Dual Taxonomy. First, neuropsychological deficits are related to increases in the likelihood of serious criminal behaviour. Of the 50 studies reviewed in the current study, 34 also produce evidence that neuropsychological deficits are related to serious or life-course-persistent criminal behaviour (see Appendix C, all studies provide evidence of this, with some exceptions[58]). In line with this literature and in further support of theory, neuropsychological deficits are not predictive of adolescent-limited or non-serious criminal behaviour. Notably, neuropsychological deficits were not examined in the Caspi et al. (1993) and Piquero and Brezina (2001) studies of non-serious offending. Thus, it is not possible to assess whether this measure was not predictive in these studies as well.

Some findings were only partially supportive of the arguments proposed in the Dual Taxonomy. The hypothesized positive relationship between family adversity and serious criminal behaviour has been supported by past research; however, it was only

[58] such as the studies by Chen and Adams (2010), Johnson (2009), and Piquero (2005), which all examine abstention from criminal behaviour over the life-course, and the studies that focussed solely on adolescent offending - Caspi et al. (1993) and Piquero and Brezina (2001).

partially supported in the current study. Two measures were included to assess family adversity: parental deviance and parental disciplinary style. Unlike a handful of studies (Weisner and Capaldi 2003; Moffitt et al. 2001a, 2001c; Roeder 1999; Paternoster and Brame 1997) that found a positive association between disciplinary style and criminal offending, the present study did not find a relationship between these measures, which is consistent with Saunders (2007). Nevertheless, several studies (e.g., Fergusson and Horwood 2002; Moffitt et al. 2001a, 2001c; Fergusson et al. 2000; Paternoster and Brame 1997) including the current one, found that parental deviance increases the likelihood of serious criminal behaviour but is not exclusively linked to serious criminal behaviour. Although the findings regarding parental discipline were contrary to hypotheses and previous research, the findings regarding the other measure of family adversity are in line with both previous research and the original hypotheses of the Dual Taxonomy.

In the current study, the role of peer rejection and knowledge of delinquent peers and their relationship to both serious and non-serious criminal behaviour is more complex than originally hypothesized in the Dual Taxonomy. First, as originally proposed, peer rejection and lack of knowledge of delinquent peers is significantly associated with decreases in the likelihood of non-serious criminal behaviour. Nonetheless, the findings depart from original hypotheses since those who reported having no peers did not completely abstain from non-serious criminal behaviour. Saunders (2007) reported a similar finding and Piquero et al. (2000) also noted that even abstainers had at least some peers. Thus, it may be the "no peer" group actually represents the group of low-level chronic offenders discussed by Moffitt (2006).

There are two other notable departures of the findings relating to the hypotheses regarding this measure. First, it was not expected that this measure would also predict serious criminal behaviour; however, Weisner and Capaldi (2003) noted that chronic high-level offenders had high levels of delinquent peer association and that the presence of delinquent peers may aid in the maintenance of serious criminal behaviours and Gardener (2006) reported similar findings. Second, the measure is not gender invariant as originally proposed. The effect of peer rejection and knowledge of delinquent peers on both serious and non-serious criminal behaviour is larger for women than men. This finding is contrary to Moffitt's argument that the effects of all of the measures of the Dual

Taxonomy are gender invariant. No other research has identified this particular gender interaction while examining the Dual Taxonomy. A possible explanation offered by Moffitt (2006) is that, in addition to having less access to delinquent peers as seen in the current study, girls may perceive the personal risk to be higher than their male counterparts and simply engage less in criminal behaviour than males as suggested by Moffitt.

Finally, the lack of a significant relationship between serious criminal behaviour and the interaction of neuropsychological deficits and parental deviance is contrary to the original hypotheses of this theory. In conjunction with Gibson et al. (2001), the present study suggests that the original hypotheses suggesting an interaction between family adversity and neuropsychological deficits may not be as argued by Moffitt (1997), as only Piquero (2001) has found evidence of this relationship in the past.

Interestingly, although many of the original hypotheses of the Dual Taxonomy were not supported in the current study, the models examining the Dual Taxonomy performed better than those examining the General Theory of Crime. Nonetheless, the models assessing the General Theory of Crime better addressed the unobserved heterogeneity associated with criminal behaviour than the Dual Taxonomy, which was unexpected given that the focus of both of these theories is between-person differences. Generally, the current study's support of the Dual Taxonomy is weak and suggests that many complexities of the measures proposed in the theory may not have been considered fully at the time of its proposal. This weak level of support, however, is also evident in literature reviewed, especially when the participants are American, which is the case in the current study (see Appendix C). In addition to the weak support of the general propositions of the Dual Taxonomy, the findings of this study do not support the first hypothesis. The Dual Taxonomy was not gender invariant and did not apply equally well to the criminal behaviour of men and women.

Age-graded Theory of Informal Social Control

Several of the measures proposed in the Age-graded Theory of Informal Social Control were related to both serious and non-serious criminal behaviour as hypothesized. Both parental attachment and involvement in school are inversely related to the likelihood of criminal behaviour. The protective ability of parental attachment has been found in many

studies examining this theory (see Meeus et al. 2004; Wade and Brannigan 1998; Sampson and Laub 1994; Sampson and Laub 1993; Laub and Sampson 1988), although some studies did not find a sustained effect of parental attachment as was found in the current study (see Laub et al. 1998). Several studies have also noted an inverse relationship between involvement in school and criminal behaviour (see Yang 2004; Deli and Mackenzie (2003) - for males only; Arum and Beattie 1999; Wade and Brannigan 1998; Sampson and Laub 1993). Additionally, presence of delinquent peers was positively associated with both types of criminal behaviour and parental deviance was positively associated with only serious criminal behaviour. The positive relationship between presence of delinquent peers and the likelihood of criminal behaviour has also been noted many times in the literature (see Massagolia and Uggen 2007; Maume et al. 2005; Simons et al. 2002; Wright et al. 2001; Ploeger 1997; Sampson and Laub 1993). The positive relationship between parental deviance and criminal behaviour has been noted in the past (see Sampson and Laub 1994; Sampson and Laub 1993).

The remaining measures of the Age-graded Theory of Informal Social Control were either non-significant or contrary to the hypotheses of the theory. Many of the background factors were not significantly related to the likelihood of criminal behavior with the exception of parental deviance. This finding has been noted previously (see Laub et al. 1998). Notably, although Sampson and Laub have provided many instances showing the protective effects of marriage and work on criminal behaviour, the current study along with several others have not found these effects to be significant. For example, Schroeder et al. (2007), Piquero et al. (2002), Kruttschnitt et al. (2000), Uggen and Janikula (1999), Uggen and Kruttschnit (1998) all provide evidence that marriage and having a job are not predictive of criminal behaviour in all instances. Yet some studies do indicate the protective role of these social statuses, such as Petras et al. (2010), Bersani et al. (2009), King et al. (2007), Sampson et al. (2006), Blokland and Nieuwbeerta (2005), Maume (2005) and Yeager (2004). Given the findings of the current study and previous studies, it appears that further examination of the role of both employment and marriage is necessary.

Consistent with the first hypothesis of the current study, none of the interactions with gender is significant, suggesting that the theory is gender invariant in its application

to criminal behaviour and that the importance of the various measures of this theory does not vary by gender. This finding is in line with the findings of half of the studies examining the differing effects of the Age-graded Theory of Informal Social Control by gender (Bersani et al. 2009; Petras et al. 2010; Giordano et al. 2002; Uggen and Kruttschnitt 1998;).

The findings relating to the Age-graded Theory of Informal Social Control generally provide weak support of the theory; nevertheless, the significant measures of this theory aid in the ability to explain both non-serious and serious criminal behaviour. This model performs better than both the models of the Dual Taxonomy and the General Theory of Crime. Although this model is one of the best explanatory models examined in this study, overall the majority of its hypotheses are not supported.

Assessment of Findings Pertaining to Hypothesis 1

The findings of the current study do not support the first hypothesis well. First, the Dual Taxonomy is not invariant by gender and does not account for the criminal behaviour of men and women in the same way. Second, the Interactional Theory and the Age-graded Theory of Informal Social Control were gender invariant and accounted for the criminal behaviour of men and women similarly. There were no discernible differences in the order of importance of the relationships between criminal behaviour and parental attachment, working, and marriage. Third, the General Theory of Crime did not differ largely by gender as expected.

Overall, the findings suggest that the theories examined are weak explanations of both serious and non-serious criminal behaviour. These theories may be improved upon through the inclusion of additional measures and through the integration of the theories. This finding is consistent with much of the previous research conducted in the field, as many of the propositions of these theories have not been definitively supported. The weak findings in this first stage of the study segues into the second stage of the study - the examination of additional measures that have been argued to be crucial in explaining the criminal behaviour of women.

Research Question and Hypothesis 2[59]

This section focuses on the findings related to the ability of the women-specific measures to predict the likelihood of criminal behaviour. First, among all respondents, the model with women-specific measures performs relatively well in terms of its ability to explain both serious and non-serious criminal behaviour. The model including the women-specific measures had both a better BIC and chi-square value associated with the random intercept than the models for the General Theory of Crime and Dual Taxonomy, which indicates the explanatory power of these women-specific measures. Nevertheless, both the Interactional Theory and Age-graded Theory of Social Control outperform the model including only women-specific measures. This finding appears to be unique. No studies explicitly compare the ability of women-specific measures and the various life-course theories in their ability to explain the criminal behaviour of both men and women. Then again, some studies have examined the effects of gendered measures on the criminal behaviour while examining criminological theories generally, and have noted increased explanatory power through the inclusion of this type of measures (for example see Giordano et al. 2002; Heimer 1996). These findings therefore support the importance of the women-specific measures.

At first examination of all respondents, the significance and the relationships between the women-specific measures and criminal behaviour were as expected. Generally, several relationships between the women-specific measures are as argued and found in previous research. For example, the protective effect of the perceived disapproval of criminal behaviour by peers was found in the current study and by Heimer (1996). Moreover, as found in previous work, the criminogenic effect of attitudes favouring criminal behaviour (for example see Heimer and De Coster 1999; Heimer 1997; Heimer 1996) and experiencing sexual and/or physical assault (for example, Katz 2000; Chesney-Lind 1989:22) found support yet again in the current study.

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[59] *Research Question 2:* Is the criminal behaviour of women over the life-course accounted for better by the inclusion of "women-specific" risk factors than by gender-neutral mainstream theories? Are gender-specific models (i.e., separate models for men and women) needed to best explain the criminal behaviour of women and men?
Hypothesis 2: It is expected that a model that includes risk factors specific to women will better account for the criminal behaviour of women than mainstream theories and that gender-specific modelling will not be necessary after the inclusion of these factors.

Some of the current findings are contrary to previous arguments. The main positive and significant effect of belief in traditional sex roles on serious criminal behaviour has not been noted previously. Heimer (1996) examined this effect separately for males and females. Among boys there was no effect of traditional beliefs and, among girls, belief in traditional gender roles decreased criminal behaviour. In the same study, Heimer also did not find a significant effect of perceived disapproval of criminal behaviour by parents on criminal behaviour, which was replicated in the current study. Additionally, the importance of physical assault by parents was not significant as previously noted by Straus (1991); however, Kruttschnitt, Ward and Shelden (1987) found the physical assault by a parent did not predetermine criminal behaviour alone. They note that the pathways between experiencing assault by a parent were quite complex and other factors should be considered such as the presence of emotional neglect or support from outside the home. In addition to this argument, Loucks and Zamble (2001) found no relationship between physical abuse in youth and total number of criminal convictions among Canadian women offenders. Given such varying findings, a more detailed examination of the role of physical assault by parents may be warranted in future research.

The primary argument surrounding the addition of the women-specific measures is that these measures are critical in explaining the criminal behaviour of women; hence, it was expected that these measures should vary by gender and generally improve the predictive ability of the models of criminal behaviour for women and not men. Partially in support of expectations, two of seven women-specific measures vary significantly by gender. Both peers' perceived disapproval of criminal behaviour and experiencing physical assault by parents interacted with gender. Further inspection of these measures in separate models for men and women, however, reveals that the women-specific measures may not be important in explaining the criminal behaviour of women only. First, the protective effect of perceived disapproval of criminal behaviour by peers is also true for the criminal behaviour of men, albeit slightly larger for women. This particular finding has been noted before (Heimer, 1996; Mears, Ploeger and Warr, 1988) and provides only the weakest support to the argument that this measure should be considered women-specific or that there is a large enough gendered effect to consider this measure

crucial in differentiating the pathways to criminal behaviour of men and women. The remainder of the findings, in fact, suggest that many of the women-specific measures are not specific to women and in some cases are more explanatory for men. For example, physical assault by parents significantly predicts criminal behavior among men only in the current study. In addition to this finding, some measures in the separate models differentially predict criminal behaviour of men and women, although the interaction in the all respondents model was not significant. For example, experiencing sexual assault and/or physical assault by someone other than parents was predictive of serious criminal behavior and sexual assault was predictive of non-serious criminal behaviour of men only. These findings, although not necessarily specific to men only, have been previously indicated in research (for example see Dutton and Hart 1998; Weeks and Widom 1998; Widom and Ames 1994; Rivera and Widom 1990). In the split model of non-serious criminal behaviour for women and in line with the proposed argument regarding the women-specific nature of these measures, belief in traditional sex roles and perceived disapproval by parents were related to decreases in the likelihood of criminal behaviour, although there were not significant interactions in the model of all respondents. These findings have been noted in the past (see Heimer 1996).

Although the above set of findings may provide some support to the arguments that these measures are in fact specific to women, it is also possible that these measures can explain the criminal behaviour of both men and women. Further support of the contention is provided by the models in which the so-called women-specific measures are added to each of the life-course theories of criminal behaviour. The addition of these measures adds significantly to the explanatory power of each of these models suggesting that the integration of these measures must be considered in the genesis of new life-course theories of criminal behaviour. Although previous research examining these life-course theories in particular has not called for more integrative theories of criminal behaviour, on the whole integrated theories have been promoted by many authors (for example see Barak 2002; Elliott 1985; Wellford 1989) . Interestingly, with the exception of the General Theory of Crime, the other life-course theories examined in this study are often already considered as integrated theories (for example, see Reid 2011).

Given the models discussed up to this point, it does not appear that modelling criminal behaviour separately by gender is necessary. Few of the gender interactions are significant in the models with all respondents and, where gender differences are highlighted in these models, often there is little difference in the magnitude of the effects for the measures in the gender-split models. The need for separate modelling by gender is discussed further in the next section.

Overall, the current findings do not support the second hypothesis of the study, as the inclusion of the variables did not account better for the criminal behaviour of women than the mainstream theories of criminal behaviour. Nevertheless, in every instance, the inclusion of the women-specific measures added significantly to the ability to explain criminal behaviour over the life-course. Thus, not only is the development of an integrative model merited given their explanatory power, the substantial overlap between the measures of various life-course theories may allow for the development of more succinct and more powerful theory of the life-course development of criminal behaviour of both men and women. The outcomes of the integrative model attempted in this study are discussed in the next section.

Research Question and Hypothesis 3[60]

The evidence in the current study indicates that the integrative models for both serious and non-serious criminal behaviour are improvements over each of the models of the life-course theories alone. Generally, the effects of the majority of measures remain similar in the integrative model as they did in the individual models, which is a testament to the large amount of overlap in the constructs of each of the theories. The one theoretical exception to this finding is the set of measures of the Dual Taxonomy. None of the measures of the Dual Taxonomy remain in either of the integrative models. Given that the integrative modelling undertaken in the current study has not been explicitly conducted previously, this is a unique finding. In some cases, self-control and the

[60] *Research Question 3:* Is the criminal behaviour of men and women over the life-course accounted for better by an integrative theory (including women-specific factors and variables of the mainstream theories) than the mainstream theory alone?
Hypothesis 3: It is expected that integrative models will account for the criminal behaviour of men and women in a similar manner and better than mainstream theories.

presence of neuropsychological deficits have been argued to be manifestations of the same underlying characteristics (for example see Ratchford and Beaver 2009). Thus, it could be that portion of the variance accounting for the latter construct was mostly accounted for by the measure of self-control in the integrative model of serious criminal behaviour, and the presence of neuropsychological deficits is not necessary when self-control is included. Interestingly, neither self-control nor the presence of neuropsychological deficits was related to non-serious criminal behaviour, which is in line with the tenets of the Dual Taxonomy and contrary to the hypotheses of the General Theory of Crime.

Given the calls for further development of integrative models during the past five decades, and many instances of improved predictive ability when more theoretical perspectives are accounted for in one model, the current findings are unremarkable. Nevertheless, the findings of the current study should further fuel the commitment to the development of fully integrated theories of criminal behaviour.

In addition to the support for integrative modelling, these models also show that as theories become more integrative, the need for gender-specific theorizing and modelling becomes limited. The findings of the current study are consistent with many of those in previous research (see studies falling under weak and strong support of the gender invariance hypothesis in Appendices A through D) and contrary to others (see studies falling in the no support categories in the same Appendices). Unlike previous studies, however, the current analysis allows for detailed understanding of the role of gender and what have been argued to be women-specific variables. The integrated model for serious criminal behaviour showed no need for gender-specific modelling. Although not as clear-cut as the model for serious criminal behaviour, the integrative model for non-serious criminal behaviour does not provide strong enough evidence to suggest that separate theories of criminal behaviour or statistical models for men and women are necessary. Given the findings of these two models, it is not necessary to model the criminal behaviour of men and women separately.

Overall, the integrative models do appear to account well for the criminal behaviour of men and women. Moreover, there is limited need for gender-specific modelling or theorizing when more integrated models are used.

Research Question and Hypothesis 4[61]

As previously discussed, random-effects modelling allows the researcher to consider both the between and within-individual effects. Allowing this type of examination can aid researchers in understanding how differences between individuals, and how changes over the course of individual's life, affect various outcomes. In the current study, random-effects modelling was chosen to maintain the ability to assess the random intercept and to eventually examine the effects of previous behaviours on current behaviour and changes in the random intercept. Nevertheless, an examination of the Hausman Test was conducted for each of the models examined in the current study to assess whether a random-effects model is in fact necessary. As previously discussed, the Hausman test assesses whether the parameters of the random-effects model are as consistent as those arising from a fixed-effects model. The findings of the current study suggest that there is no benefit of random-effects modelling as not a single Hausman Test supported the premise that the parameters of the random-effects models were as consistent as those in the fixed-effects models. Allison (1994) has previously argued that fixed-effects modelling is preferable to random-effects modelling because of its ability to remove selection biases. Ultimately, this finding suggests that there is no need to assess the time-invariant measures or the between-individual variation in relation to criminal behaviour, suggesting that gender-specific modelling may be unnecessary. It should be noted, however, that some authors (see Clark and Lizner, 2012) argue that the outcome of the Hausman test should not be taken as sole impetus for choosing between random- or fixed-effects modelling.

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[61] *Research Question 4:* Beyond the interest in examining both between- and within-individual effects, is it necessary to use random-effects modelling to understand the criminal behaviour of men and women over time?
Hypothesis 4: It is expected that the use of random-effects modelling will be preferred over fixed-effects modelling as the time-invariant because some of the time-invariant characteristics being examined in the models have been previously shown to influence criminal behaviour (i.e., gender, ethnicity, social class).

Research Question and Hypothesis 5[62]

As previously discussed, past behaviours can often be crucial in understanding current behaviours, and, as such, the examination of lagged effects can help clarify the role of particular measures over the life-course. Moreover, we can also get a sense of the importance of these previous behaviours in explaining current criminal behaviour through assessing changes in the chi-square value associated with the random intercept representing unobserved heterogeneity and the BIC of the model.

On the whole, lagged effects matter in explaining criminal behaviour. Both the BIC and the chi-square associated with the random intercept of lagged effects models are significantly reduced from the integrative model with no lagged effects. This difference is especially the case for non-serious criminal behaviour; nonetheless, the chi-square value associated with the random intercept remains significant, suggesting that there are still other variables which are necessary for the best possible explanation of criminal behaviour.

Specifically, the first-order lags of each type of criminal behaviour are important for predicting current serious and non-serious criminal behaviour. This finding has been noted previously (for example, see Blokland 2005; Matsueda and Kreager 2004; Bushway, Brame and Paternoster 1999; Paternoster and Nagin 1997; Nagin and Paternoster 1991). In addition to the first-order lag, a second-order lag also positively predicts current non-serious criminal behaviour. Although not particular to non-serious criminal behaviour, previous research has provided similar findings (see Blokland 2005; Bushway et al. 1999). Overall, the current study, like many of the above-mentioned studies, provides evidence suggesting the importance of state dependence and continuity in criminal behaviour over the life-course. Many researchers, as outlined in the introduction of this thesis, have shown a long-term continuity in offending (i.e., from early adolescence to mid-adulthood), which is contrary to the findings here. The effects of state dependence do not appear to be as long lived as found in previous research;

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[62] *Research Question 5:* Do the lag effects of significant independent variables and the dependent variable aid in the explanation of the criminal behaviour of men and women over the life-course?
Hypothesis 5: Lag effects will significantly account for the criminal behaviour or men and women and their explanatory power will reduce the random intercept significantly (i.e., unobserved heterogeneity).

however, this finding may be related to the increased number of times these variables have been measured and the ability to better assess how long state dependence is occurring.

A first-order lag effect of attitudes favouring criminal behaviour and involvement in school are predictive of criminal behaviour (serious and non-serious). Previous research has not only shown that involvement in school has a protective effect, but involvement in school has a lasting impact on criminal behaviour (for example, see Thornberry, Moore and Christenson 2006; Arum and Beattie 2006; LeBlanc, Vallieres and McDuff 1993). The finding, however, for the effect of pro-criminal attitudes is rather counter-intuitive. Previously favourable attitudes toward criminal behaviour are associated with reductions in the likelihood of current criminal behaviour. There are some possible explanations for this observation. This effect may be confounded with maturation or ageing-out of criminal behaviour and regardless of how much one favours criminal attitudes, they are simply less likely to commit criminal behaviour in the future; arguably, however, we could then expect this relationship for all lagged effects. An extension of this argument is found in the Dual Taxonomy. Moffitt (1997:22-35) contends that adolescents often engage in non-serious or adolescent-limited criminal behaviour in an attempt to gain adult independence. Conceivably, one way in which an adolescent may show his or her desire for autonomy is through the endorsement of pro-criminal attitudes[63]. Thus, more attitudes favouring criminal behaviour in adolescence may lead to reduce future criminal behaviour because rebellious youth quickly desist from criminal behaviour as opportunities for legitimate independence arise.

In addition to the importance of these lagged effects, the first-order and second-order lag effects of physical assault by others and the first-order lag effect of the presence of delinquent peers are respectively associated with increases in serious and non-serious criminal behaviour. With regard to the first finding, several authors (see Giordano et al. 2002:995; Katz 2000:653; Chesney-Lind 1989:22) and some research (see Loucks and Zamble 2001; Dutton and Hart 1998; Weeks and Widom 1998; Widom and Ames 1994;

[63] In the current study, there is a slight increase in the overall score of attitudes favouring criminal behaviour in Wave 3 through 5, when the majority of respondents would have been aged 13 to 18 years of age. There is some evidence to suggest that favouring criminal behaviours may increase in the mid-adolescence period.

Rivera and Widom 1990) have indicated the continued effects of physical assault on serious criminal behaviours. Regarding the second finding, Moffitt (1997:27) has argued that the presence of delinquent peers is an important step in the initiation of adolescent-limited offending (i.e., non-serious criminal behaviour). These findings are consistent with previous arguments and findings.

Overall, the findings of the current study do support the fifth hypothesis. The inclusion of both first- and second-order lagged effects does reduce the chi-square value associated with the random intercept significantly, although not to non-significance. Lagged effects play an important role in explaining criminal behaviour over the life-course and should be considered in future research.

Implications of the Current Findings for Theory, Methods, and Policy

This section examines the implications of the current findings on the development of criminological theory and the research methods and statistical techniques used to study criminal behaviour. Finally, consideration is given to policy implications of some of the findings in the study.

Implications for Theory

There are several theoretical considerations that arise from the findings of the current study. First, the mainstream life-course theories of criminal behaviour performed weakly; albeit most studies in the present review generally provided weak support of these theories as well. One of the major contributions of the current study was to not only systematically examine each of the theories individually, but assess the impact of a range of additional measures on criminal behaviour, and to combine all of these measures into an integrative model. Above and beyond all previously identified research, a thorough examination of four popular life-course theories of criminal behaviour was conducted simultaneously on a single data set. This approach allows both the researcher and reader to understand and compare how every measure works and how they relate to one another upon integration. The overall finding of this systematic exercise is that each of these mainstream theories could be improved upon. There are several ways that this improvement could be accomplished, such as including the additional measures examined in the current study, developing a new integrative theory from these findings, explicitly

theorizing about and including lagged effects, and including additional measures that were outside the scope of the current work.

This study indicates that the inclusion of other measures such as physical assault, sex assault, attitudes about criminal behaviour, and perceived disapproval of criminal behaviour by others account for substantial portions of the variance in criminal behaviour both between- and within-individuals over the life-course. These variables are a valuable addition to each of the theories tested in this study. For example, the measures of perceived disapproval in fact could be tapping the concept of "informal social control" as proposed by Sampson and Laub and could be considered as a different operationalization of the theory. Given the substantial overlap between the theories and how well the integrative model performed in the current study, future research could focus on the development of a new life-course theory that captures many of the variables found to be related to both serious and non-serious criminal behaviour in the integrative models of the current study. Although parsimony should be key in the development of theory, it should not be valued to the exclusion of other important variables. Future research focussing on the integrative modeling of criminal behaviour may very well lead to the next wave of criminological theory.

Some life-course research has considered or even theorized about state dependence, through concepts such a cumulative consequence or disadvantage, only a few studies in this field have examined how past criminal behaviour affects current criminal behaviour (for example, see Paternoster and Brame (1997); Nagin and Paternoster 1991). The current study has moved beyond such a dearth of knowledge in the area and has shown that lag effects of several of the measures of main stream life-course theories are important in explaining current criminal behaviour. The development of a theory which attends to the concept of state dependence and also identifies the length of time a previous behaviour can have an effect on current behaviour is actually crucial in understanding the unfolding of criminal behaviour over the life-course. In other words, future theoretical development should not only incorporate the concept of state dependence but should also clarify how the state dependence is expected to function. For example, if one hypothesizes about the lasting influence of school involvement on criminal behaviour, hypotheses regarding the duration of this effect would be beneficial

in the modelling of criminal behaviour over the life-course. Another example is the effect of former incarceration: does previous incarceration have a more proximal or distal impact on future criminal behaviour over the life-course? Furthermore, understanding the duration of the influence of past behaviour on current or future behaviour can inform the development of intervention programs that aim to reduce criminal behaviour.

Finally, the current research indicates that more measures are necessary to fully account for the criminal behaviour of men and women. Further development of theory should identify other processes beyond what has been included in the present study. Notably, a limitation of the current research is the inability to include some measures that are often found to be criminogenic. In some cases, these measures were not included because they were outside the confines of the current study (e.g., time spent in extracurricular activities, labelling, neighbourhood problems, and aspirations). In other cases, however, it was not possible to include an arguably important measure because of data collection issues associated with the secondary dataset. One such example is a measure of substance use. Substance abuse is associated with criminal behaviour in the literature (Bennett, Holloway and Farrington 2008) and has been cited as being particularly important in explaining the criminal behaviour of women (for example, see Fazael, Bains and Doll 2006; Widom and White 2006; Lederman, Dako, Larrea and Li 2004). Unfortunately, due to changes in the language of questions regarding substance use over the many waves of data collection in the NYS, it was not possible to include this measure in the current study. The role of substance use must be considered theoretically and included in modelling in future research examining criminal behaviour.

The major implication of the findings of this study is that the criminal behaviour of men and women does not need to be theorized separately as long as the theories are specified correctly. There is an ample body of literature that argues for the need of gender-specific models of criminal behaviour. One of the overarching goals of the current study was to thoroughly examine the role of gender in explaining criminal behaviour. In doing so, the interaction of gender with the theorized measures was analyzed critically. The systematic examination of the gender role has not been undertaken in the same degree in previous research and the current study provides the opportunity to fully understand the role of gender in explaining criminal behaviour. From the many steps

taken in the current study, it does not appear necessary to theorize about or model the criminal behaviour of women separately from men.

Implications for Research Methods

As with much research, several implications for research methods are derived from the findings of the current study. The following implications will be discussed: the measurement of criminal behaviour, the measurement of theoretical constructs, unexpected effects of some theoretical measures or control variables, the importance of examining both between- and within-person effects, the need for longitudinal design, and the quandary of studying the role of gender.

The crux of any study examining criminal behaviour is to how best to define and measure this behaviour. Some authors (for example see Gottfredson & Hirschi 1990) have argued that only a single measure of criminal behaviour is necessary to assess the general theories of crimes, whereas others (e.g., Moffitt 1997) have argued that serious and non-serious crimes are different in their etiology and therefore must be studied separately. In some cases, others have focussed on the difference between participation in and frequency of criminal behaviour (e.g., Smith, Visher, Jarjoura and O'Leary 1991; Nagin and Smith 1990). Regardless of these arguments, researchers have pressed on using many different measures of criminal behaviour. With regard to the life-course theories examined here, few studies have fully considered any differences in outcome based on definition of criminal behaviour or examined a count measure of criminal behavior. The current study adds to the body of literature in that it provided the opportunity to examine both serious and non-serious criminal behaviour; it also considered the quantity of the behaviour over the life-course. Although not a focus of the current study, the findings do indicate that there are limited differences in the measures that are predictive of serious and non-serious criminal behaviour. Contrary to arguments regarding the importance of specific type of criminal behaviour, it appears that there is little need to separate these behaviours.

Measurement issues are not only a concern for the dependent variable. All studies are affected by the ability to best operationalize theoretical constructs and the current study is not excluded. There are several examples in the current study where measurement could have been improved. As previously discussed, the measures of the

Dual Taxonomy did not perform well and this may have been related to measurement issues rather than a true lack of significance. Interestingly, some of the lagged effects support the propositions of the Dual Taxonomy regarding adolescent-limited offending. Two implications arise from issues with measurement. First, researchers need to carefully assess whether longitudinal data actually allow them to examine their area of interest. As in many previous studies, the NYS provided ample measures to assess numerous research questions, however, measurement limitations remain. Second, when planning for longitudinal data collection, researchers must be cognizant of their own study purposes, proposed statistical techniques, and consistency in language, meaning, and questioning over time. Attention to these details ensures that researchers can best assess their research questions and meet their goals.

In some cases, there were unexpected directions of effects of theoretical measures and control variables. For example, presence of children increased the likelihood of criminal behaviour. In the current discussion, some possibilities for these findings were made. These post-hoc considerations should be examined in future research. Another peculiar result was the varying role that the control variable of ethnicity played across models. For example, it was not possible to include ethnicity in many of the models of non-serious criminal behaviour, although it could be included when examining serious criminal behaviour. Moreover, in several instances, ethnicity was significant only among women. Given its role as a control variable, these variations in significance across models was not explicitly attended to in the results section; nevertheless, future research could more actively assess the role of race in a manner similar to what has been done with gender in the current study. A full understanding of the role that race may play in explanatory power of the life-course theories would be beneficial.

As previously discussed, only a few of the studies reviewed in this paper examined both between- and within-person effects. Although the Hausman Test indicated that random-effects modelling is not necessary, the major contribution of the current study was the examination of both between- and within-individual effects. The use of random-effects modelling highlighted the ability to account for unobserved heterogeneity. Additionally, the inclusion of lag effects, which assessed the role of state dependence, highlighted the role of both between and within individual variability. The

ability to assess each of these components of variation is important for theories such as those examined in the current study, as each of these theories has both static and dynamic features that require both types of variation to be considered. Thus, the current study has added to the body of literature through the use of this type of modelling.

One of the primary reasons for the use of random-effects modelling was to examine the effect of lags. Through the examination of lag effects, some notable implications regarding the necessity for longitudinal research design arose. As previously discussed, primarily first-order lag effects were significant and a handful of second-order lags were also significant. This finding indicates that there is little state dependence occurring beyond one or two waves prior to the current wave. Although not all waves had similar periods of time between them, the longest period which could be accounted for in a second-order lag is six years; however, the NYS data used in this study collected ten years of data. This finding suggests that the need for long-term longitudinal research may not be as great as the resources that are demanded of it because of the shorter duration over which previous behaviour affects current behaviour. Moreover, many of the measures that were more static and distal to the timing of criminal behaviour generally were not found to be related to these behaviours over the life-course. Laub et al. (1998) has also noted this result. Thus, long-term follow-ups may not be necessary for the study of criminal behaviour, especially since so much of criminal behaviour begins and ends in youth. Short periods of follow-up will reduce the resources that are required for multiple, long-term follow-ups, and would reduce issues with attrition over long periods of time. For example, although the NYS has a low attrition rate over the first ten years, about half the attrition occurs only in the first five years. Although not as harsh as Gottfredson and Hirschi's (1990) contentions that longitudinal research is not beneficial, shorter periods of follow-up may have benefits when compared with longer follow-up periods.

The findings of this study suggest that there is no need to examine the criminal behaviour of men and women separately. These conclusions are based on the examination of statistical interactions between gender and theoretical measures. Many studies (for example see Shekarhar and Gibson 2011; Petras et al. 2010; Bersani et al. 2009; de Kemp et al. 2009; McGloin and Shermer 2009; Higgins and Tewksbury 2006; Ribeaud and Eisner 2006; Blackwell and Piquero 2005; Vazsonyi and Crosswhite 2004; Vazsonyi

et al. 2004; Mason and Windle 2002; Moffitt et al. 2001a,b,c Vazsonyi et al. 2001; Fergusson et al. 2000; Lynskey et al. 2000; Avakame 1998; Burton et al. 1998; Uggen and Kruttschnitt 1998; Heimer 1996; Tibbetts and Hertz 1996) implicitly assume gender differences by examining models separately by gender and not assessing whether the parameters of the two models differ. There are many examples in the current study where there is no apparent interaction between gender and a given measure among all respondents; however, there is a difference in the effect of the given measure when the criminal behaviour of men and women is modelled separately. The current study attends to only significant interactions between gender and the theoretical measures and not to differences found in the split models only. Future researchers should give consideration of methods used to assess gender differences. In conducting future gender research, if a researcher chooses to compare the parameters of a given measure for men and women, further thought should be given to statistical tests that assess whether gender differences are present and significant.

Overall, the current study provides a few insights on the impact of research design on the results and in turn the impact that these results have on future considerations about research design. That is, although measurement issues may have had an impact on the outcomes in the current study, several of the findings provide meaningful points of consideration for future researchers.

Implications for Policy

A few findings in the study may be useful in developing interventions for criminal behaviour. The significant effect of some of the lag variables suggests that there is potential to intervene among those who have behaved criminally to avoid future criminal behaviour. For example, the first-order lag of involvement in school was significant, and, therefore, not only is current participation in school protective against criminal behaviour, but so is the previous year's involvement in school. Thus, interventions designed to maintain high involvement in school could be effective in reducing criminal behaviour for at least one year. Another practical implication is that the first-order and second-order lag effect for physical assault was associated with increases in criminal behaviour. This information can be used to develop targeted interventions, such as counselling, aimed at

individuals who have suffered a physical assault. The development of this type of program could be effective in reducing future criminal behaviour.

Finally, the importance of state of dependence with regard to criminal behaviour cannot be overlooked when developing intervention strategies. The previous wave's serious criminal behaviour was positively associated with current serious criminal behaviour and the previous two waves were important for non-serious criminal behaviour. This association suggests that state dependence is occurring and that the reduction of initial criminal behaviour may divert future criminal behaviours. Thus, a focus on the initiation of criminal behaviour is important since continuation of these behaviours is relatively likely, although limited in duration of continuity. Interventions could be targeted at children prior to the initiation of criminal behaviour. Not only could future research try to identify the children most at risk for the initiation of criminal behaviour but there could also be a focus on assessing the timing of criminal behaviour. Many have argued that there are differences in the risk profiles of the individuals that are classified as early starters as compared to those that are considered to be late starters (for example see Patterson, Forgatch, Yoerger 1998). The ability to understand the specific timing at which an intervention would be necessary or whether there is a need for different interventions depending on potential differences in the timing of or the risk factors associated with the initiation of criminal behaviour would be beneficial.

Conclusion

The primary goal of the current study was to systematically assess four mainstream theories – namely, The General Theory of Crime, The Interactional Theory, The Dual Taxonomy, and the Age-graded Theory of Informal Social control – of the development of criminal behaviour over the life-course while thoroughly examining the role of gender including the role of several measures that have been considered important in the explanation of the criminal behaviour of women. A secondary goal of this study was to explore both the within- and between-person variations and the role of unobserved heterogeneity (i.e., population heterogeneity) and lag effects (i.e., state dependence) in explaining the criminal behaviour of men and women.

To meet these goals, Random-Effects Negative Binomial Models were used for both serious and non-serious criminal behaviour using panel data collected in the NYS.

The models explored the role of gender in each of the life-course theories and a collection of measures, which have been argued to be necessary in explaining the criminal behaviour of women, through the inclusion of several interactions between gender and various measures of the theories. In addition, when gender interactions were significant, the models were examined separately for men and women.

The findings of this study indicate the following:

1) integrating various theories into a single theory of criminal behaviour over the life-course provides better explanations of criminal behaviour; at minimum, current life-course theories need to consider additional factors in explaining criminal behaviour;
2) gender-specific theorizing and modelling about criminal behaviour are not necessary when theories are integrative;
3) random-effects modelling is useful in considering both between and within-individual effects while providing the opportunity to assess both population heterogeneity and state dependence, although the Hausman test indicated that only fixed-effect modelling is necessary; and,
4) lag effects are important in explaining the criminal behaviour of men and women.

The findings in this study enhance our understanding of the role of gender, population heterogeneity, and state dependence in criminal behaviour and can play a role in the development of theory, research methods, and policy. Nevertheless, like all research, both the limitations and the questions left unanswered by the current research segue to the implications for future research. A handful of data collection issues give rise to considerations that are necessary in the development of future research. Use of more recent longitudinal data would be preferred; however, access to public use data of this quality is not realistic. Moreover, a larger age range of participants and the over sampling of women, given their low rates of participation in serious criminal behaviour, would be beneficial. In addition to these considerations, future research could also focus on the role of ethnicity and the presence of children as their relationships with criminal behaviour are not as clear as previously argued. Research examining the initiation and timing (in other words, the onset) of criminal behaviour will aid in the development of appropriate interventions. These findings provide impetus for further integration of criminological

theories and the explicit inclusion of the concepts of population heterogeneity and state dependence.

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APPENDICES

Appendix A: Empirical Studies of a General Theory Crime by Level of Support for the Theory

Support of Theory	General Population Adult Sample	College Convenience Sample	Youth Sample	Offender Sample	Invariance Hypothesis: Gender
No	Forde & Kennedy (1997) Redmon (2003)		Alvarez et al. (2010)	Krauss et al. (2000)	Tibbetts and Herz (1995) Longshore et al. (1996) Burton et al. (1998) Longshore and Turner (1998) Henry et al. (1999)[1] Lagrange & Silverman (1999) Piquero et al. (2000) Blackwell & Piquero (2005) Higgins and Tewksbury (2006) Shekarkhar & Gibson (2011)
Weak	Burton et al. (1998)	Tibbetts & Herz (1996) Piquero & Tibetts (1996) Sellers (1999) Piquero et al. (2000) Simpson and Piquero (2002) Romero et al. (2003)[5] Langton et al (2006) Jones et al. (2007) Higgins et al. (2007)	Brownfield & Sorensen (1993) Tremblay (1995)[1] Sorensen & Brownfield (1995) Junger & Tremblay (1999)[1] Wright et al. (1999)[1] Nakhaie et al. (2000) Hay (2001) Wright et al. (2001)[1] Mason & Windle (2002)[1] Stylianou (2002) Peter et al. (2003) Vazsonyi & Crosswhite (2004) Vazsonyi et al. (2004) Chapple (2005)[1] Burt et al. (2006)[1] Morris et al. (2006) Ribeaud & Eisner (2006) Unnever et al. (2006) Winfree et al. (2006) McCartan & Gunnision (2007)[1] Cheung and Chueng (2008) Cretacci (2008) DeLisi & Vaughan (2008)[4]	Longshore et al. (1996) Longshore & Turner (1998) Piquero & Rosay (1998) DeLisi et al. (2003) Cauffman et al. (2005)[2] Piquero et al. (2005) Conner et al. (2009)[1]	Keane et al. (1993) Avakame (1998) Mason and Windle (2002) Vazsonyi & Crosswhite (2004) Ribeaud & Eisner (2006) Cheung & Cheung (2010)[1]

Support of Theory	General Population Adult Sample	College Convenience Sample	Youth Sample	Offender Sample	Invariance Hypothesis: Gender
			de Kemp et al. (2009)[1] McGloin, & Sherner (2009)[1] Miller et el. (2009) Cheung & Cheung (2010)[1] Holtfreter et al. (2010)[1] Moon et al. (2010)[1]		
Moderate	Grasmick et al. (1993) Keane et al. (1993) Burton et al. (1994) Evans et al. (1997) Burton et al. (1999) Blackwell & Piquero (2005)	Nagin & Pasternoster (1993) Higgins (2002) Tittle et al. (2003)	Polakowski (1994) Vazsonyi (1996) Avakame (1998) Henry et al. (1999)[1] Lagrange & Silverman (1999) Gibson et al. (2000) Lynskey (2000) Vazsonyi et al. (2001) Schrek (2002)[1] Turner & Piquero (2002)[1] Baron (2003) Chapple & Hope (2003) Unnever et al. (2003) Vazsonyi (2003) Perrone et al. (2004) Higgins & Tewksbury (2006) Meldrum et al. (2009)[1] Shekarkhar & Gibson (2011)	Deng & Zhang (1998[3]) Longshore (1998) DeLisi (2001) DeLisi (2001a) Cleary (2004) Longshore et al. (2004) Piquero et al. (2007)[1, 3]	Piquero & Rosay (1998) Lynskey et al. (2000) Vazsonyi et al. (2001) Vazsonyi et al. (2004) de Kemp et al. (2009)[1] McGloin & Sherner (2009)[1]

Note: Pratt and Cullen (2000) also conducted a meta-analysis of 21 studies assessing the relationship between low self-control and crime/delinquency/analogous behaviours. The meta-analysis provides moderate support for the inverse relationship between low self control and criminal behaviour proposed by the General Theory of Crime; [1]indicates longitudinal study, [2] study include non-offenders as well; [3] sample includes youth offenders only; [4] study includes offenders and non-offenders; [5] sample also included high school students

Appendix B: Empirical Studies of Interactional Theory by Level of Support for the Theory

Support of Theory	National Youth Survey Sample	Rochester Youth Developmental Survey Sample	Invariance Hypothesis: Gender
No			Jang and Smith (1997)[1]
Weak	Lawrence (1991) Matsueda & Anderson (1998)[1] Mears & Field (2002)	Thornberry et al. (1994)[1] Krohn et al. (1996)[1] Jang & Smith (1997)[1] Thornberry et al. (1998)[1]	Lawrence (1991) Thornberry et al. (1991)[1] Krohn et al. (1996)[1]
Moderate	Jang (1999)[1]	Thornberry et al. (1991)[1] Thornberry et al. (2003)[1]	

[1]indicates longitudinal study.

Appendix C: Empirical Studies of the Dual Taxonomy by Level of Support for the Theory

Support of Theory	Dunedin Multidisciplinary Health and Development Study Sample	International Samples	American Samples	Invariance Hypothesis: Gender
No		Kratzer & Hodgins (1999) [1]	Pasternoster & Brame (1997) [1] White et al. (2001) [1] Chung et al. (2002) [1] Sampson & Laub (2003)[1] Sampson & Laub (2005)[1] Johnson (2009)[1] Walter (2011)[1]	Kjelsberg (1999) Katzer & Hodgins (1999) Barnes & Beaver (2010)[1]
Weak	White et al. (1990) [1] Moffitt et al. (2002) [1]	Nagin et al. (1995) [1] Stattin et al. (1997) [1] Kjelsberg (1999) [1] Roeder et al. (1999) [1] Fergusson & Horwood (2002) [1] Carroll et al. (2006) Yessine (2009)[1] Stattin et al. (2010)[1] Savolainen et al. (2010)[1]	Dean et al. (1996) [1] Zebrowitz et al. (1998) [1] Aguilar et al. (2000) [1] Donellan et al. (2000) [1] Ge et al. (2001) [1] Piquero and Brezina (2001) [1] Mazerolle & Maahs (2002) Piquero & White (2003) [1] Wiesner & Capaldi (2003) [1] Piquero et al. (2004) [1] Cauffman et al. (2005) Piquero et al. (2005) Raine et al. (2005) [1] Saunders (2007) [1] Parker & Morton(2009) Barnes & Beaver (2010)[1] Chen (2010)[1] Chen & Adams (2010)[1] Roisman et al. (2010)[1]	Moffitt et al. (2001b) [1] Piquero et al. (2005) Yessine (2009)[1] Chen & Adams (2010)[1] Roisman et al. (2010)[1] Barnes et al. (2011)[1]
Moderate	Moffitt et al. (1990) [1] Caspi et al. (1993) [1] Moffitt et al. (1996) [1] Bartusch et al. (1997) [1] Moffitt et al. (2001a) [1] Moffitt et al. (2001b) [1] Moffitt et al. (2001c) [1] Moffitt and Caspi (2005) [1]	Fergusson et al. (2000) [1] Woodward et al. (2002) [1]	White et al. (1994) [1] Gibson et al. (2001) [1] Piquero et al. (2001) [1]	White et al. (1990) [1] Fergusson et al. (2000) [1] Moffitt et al. (2001a) [1] Moffitt et al. (2001c) [1] Fergusson & Horwood (2002) [1] Moffitt & Caspi (2005) [1]
Strong	Moffitt (2006)[1]		Gardener (2006) Barnes et al. (2011)[1]	

[1]indicates longitudinal study.

Appendix D: Empirical Studies of the Age-graded Theory of Informal Social Control by Level of Support for the Theory

Support of Theory	Unravelling Justice Data	General Population Studies	Offender Populations	Invariance Hypothesis: Gender
No	Hardwick & Brannigan (2008)[1]	Ploeger (1997)[1] Hartnagel (1998)[1] Warr (1998)[1] Uggen & Janikula (1999)[1] Simons et al. (2002)[1] Ford & Schroeder (2011)[1]	Uggen & Kruttschnitt (1998) [1] Deli &Mackenzie (2003)[1] Schroeder et al. (2007)[1]	Mason & Windle (2002)[1] Simons et al. (2002)[1] Deli & Mackenzie (2003)[1] King et al. (2007)[1]
Weak	Sampson & Laub (1989)[1]	Horney et al. (1995)[1] Wade & Branigan (1998) Arum & Beattie (1999)[1] Mason & Windle (2002)[1] Wright et al. (2002)[1] Maume et al. (2005)[1] Massoglia & Uggen (2007)[1] Bersani et al. (2009)[1] King et al. (2007)[1]	Hughes (1998) Kruttschnitt, et al. (2000)[1] Giordano et al. (2002)[1] Piquero et al. (2002)[1] Yang (2004)[1,2] Yeager (2004)[1] Blokland et al. (2005)[1] Blokland & Nieuwbeerta (2005)[1, 2] Liu (2005)[1] Petras et al. (2010)[1]	Bersani et al. (2009)[1] Petras et al. (2010)[1]
Moderate	Sampson & Laub (1990)[1] Laub et al. (1998)[1] Doherty (2006)[1] Sampson et al. (2006)[1]	Wright et al. (2001)[1] Meeus et al. (2004)[1] Wright & Cullen (2004)[1]	Savolainen (2010)[1]	Uggen & Kruttschnitt (1998) [1] Giordano et al. (2002)[1]
Strong	Laub & Sampson (1993)[1] Sampson & Laub (1993)[1] Sampson & Laub (1994)[1] Laub & Sampson (2003)[1]			

[1]indicates longitudinal study; [2] also included non-offenders

Appendix E: Dependent and Independent Measures

Concept/Variable	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
Year	1976	1977	1978	1979	1980	1983	1986
Dependent Variables – Self-reported Criminal Behaviours							
Serious Criminal Behaviours							
Stolen (or tried to steal) a motor vehicle, such as a car or motorcycle	X	X	X	X	X	X	X
Stolen (or tried to steal) something worth more than $50 dollars	X	X	X	X	X	X	X
Bought or sold stolen goods - knowingly bought, sold or held stolen goods (or tried to do any of these things)	X	X	X	X	X	X	X
Attacked someone with the idea of seriously hurting or killing him/her	X	X	X	X	X	X	X
Been paid for having sexual relations with someone	X	X	X	X	X	X	X
Been involved in gang fights	X	X	X	X	X	X	X
Had (or tried to have) sexual relations with someone against their will.	X	X	X	X	X	X	X
Non-serious Criminal Behaviours							
Sold hard drugs such as heroin, cocaine, and LSD.	X	X	X	X	X	X	X
Carried a weapon - carried a hidden weapon other than a plain pocket knife.	X	X	X	X	X	X	X
Stolen (or tried to steal) things worth $5 or less	X	X	X	X	X	X	X
Sold marijuana or hashish. (pot", "grass", "hash")	X	X	X	X	X	X	X
Hit (or threatened to hit) one of your parents.	X	X	X	X	X	X	X
Used force (strong-arm methods) to get money or things from other people (not students or teachers).	X	X	X	X	X	X	X
Stolen (or tried to steal) things worth between $5 and $50.	X	X	X	X	X	X	X
Broken into a building a building or vehicle (or tried to break) to steal something or just to look around.	X	X	X	X	X	X	X
General Theory of Crime – Independent Variables							
Self-control							
Use alcohol	X						
Use marijuana	X						
Obscene phone call rate	X						
School suspension rate	X						
Skipped school rate	X						
Public drunkenness rate	X						
Avoid payment rate	X						
Joyriding rate	X						
Disorderly conduct rate	X						
Hitchhiking rate	X						
Cheating rate	X						
Sex rate	X						
Lied rate	X						
Throw object rate	X						
Opportunity							

Concept/Variable	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
Year	1976	1977	1978	1979	1980	1983	1986
Particular Group of Friends	X	X	X	X	X	X	X
Afternoons with friends	X	X	X	X	X	X	X
Evenings with friends	X	X	X	X	X	X	X
Weekends with friends	X	X	X	X	X	X	X
Parental attachment							
Outsider with family	X						
Feel lonely with family	X						
Family not interested	X						
Family listens to problems	X						
Feels close to family	X						
Interactional Theory – Independent Variables							
Social class							
Public assistance	X						
Parental attachment/supervision							
Afternoon with family	X	X	X	X	X	X	X
Evenings with family	X	X	X	X	X	X	X
Weekends with family	X	X	X	X	X	X	X
School commitment							
Teachers don't call on me	X						
Nobody at school cares	X						
I don't belong at school	X						
Feel lonely at school	X						
No special projects	X						
Conventional activities							
Attending school	X	X	X	X	X	X	X
Work	X	X	X	X	X	X	X
Conventional beliefs							
Good job important	X	X	X	X	X	X	X
College important	X	X	X	X	X	X	X
Delinquent peers							
Used marijuana	X	X	X	X	X	X	X
Stole something less $5	X	X	X	X	X	X	X
Hit someone	X	X	X	X	X	X	X
Commitment to Family of Procreation							
Married	X	X	X	X	X	X	X
Children	X	X	X	X	X	X	X
Dual Taxonomy – Independent Variables							
Neuropsychological deficits							
Grade failure	X	X	X	X	X	X	X
Autonomy							
Delinquent peer influence							
Cheated on tests	X	X	X	X	X	X	X
Destroyed property	X	X	X	X	X	X	X
Used marijuana	X	X	X	X	X	X	X
Stole something less $5	X	X	X	X	X	X	X
Hit someone	X	X	X	X	X	X	X
Used alcohol	X	X	X	X	X	X	X
Broke into vehicle	X	X	X	X	X	X	X
Sold hard drugs	X	X	X	X	X	X	X
Stolen something > $50	X	X	X	X	X	X	X
Suggested you break the law	X	X	X	X	X	X	X
Age	X	X	X	X	X	X	X
Peer rejection							
Particular Group of Friends	X	X	X	X	X	X	X
Family adversity							
Respondent discipline style	X						
Parental deviance							

Concept/Variable	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
Year	1976	1977	1978	1979	1980	1983	1986
Cheat on income tax	X						
Steal something $50 up	X						
Use marijuana/hashish	X						
Be drunk in public place	X						
Damage/destroy property	X						
Steal something $5 down	X						
Hit someone	X						
Break into to steal	X						
Sex other then spouse	X						
Use hard drugs	X						
Informal Social Control – Independent Variables							
Structural background factors							
Public Assistance (low SES)	X						
Family Size (# of kids home)	X						
Single parent home	X						
Parental deviance	X						
Cheat on income tax	X						
Steal something $50 up	X						
Use marijuana/hashish	X						
Be drunk in public place	X						
Damage/destroy property	X						
Steal something $5 down	X						
Hit someone	X						
Break into to steal	X						
Sex other then spouse	X						
Use hard drugs	X						
Individual differences							
Difficult temperament							
Bad kid	X						
Early conduct disorder							
Offense before age 12							
Stole motor vehicle	X						
Stole something >$50	X						
Set Fire to Property	X						
Attacked someone	X						
In gang fight	X						
Sexual assault	X						
Broken into building	X						
Used force on someone	X						
Hurt someone for sex	X						
Sold hard drugs	X						
Injured spouse/partner	X						
Family social control							
Lack of supervision							
Afternoon with family	X	X	X	X	X	X	X
Evenings with family	X	X	X	X	X	X	X
Weekends with family	X	X	X	X	X	X	X
Respondent discipline style	X						
Parental rejection							
Outsider with family	X						
Feel lonely with family	X						
Family not interested	X						
School social control							
Importance of school	X	X	X	X	X	X	X
Afternoons on school	X	X	X	X	X	X	X
Evenings on school	X	X	X	X	X	X	X
Weekends on school	X	X	X	X	X	X	X

Concept/Variable	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
Year	1976	1977	1978	1979	1980	1983	1986
Delinquent peer influence							
Cheated on tests	X	X	X	X	X	X	X
Destroyed property	X	X	X	X	X	X	X
Used marijuana	X	X	X	X	X	X	X
Stole something less $5	X	X	X	X	X	X	X
Hit someone	X	X	X	X	X	X	X
Used alcohol	X	X	X	X	X	X	X
Broke into vehicle	X	X	X	X	X	X	X
Sold hard drugs	X	X	X	X	X	X	X
Stolen something > $50	X	X	X	X	X	X	X
Suggested you break the law	X	X	X	X	X	X	X
Cumulative consequences							
Time incarcerated	X	X	X	X	X	X	X
Adult social bonds							
Weak labour force attachment							
Work	X	X	X	X	X	X	X
Importance of work	X	X	X	X	X	X	X
Weak marital attachment							
Married	X	X	X	X	X	X	X
Activities with partner				X	X	X	X
CONTROLS							
Age	X	X	X	X	X	X	X
Gender	X						
Ethnicity	X						
WOMEN-SPECIFIC INDEPENDENT VARIABLES							
Physical abuse							
Mother/father	X	X	X	X	X	X	X
Other	X	X	X	X	X	X	X
Sexual abuse	X	X	X	X	X	X	X
Gender socialization							
Father should have greater authority than mothers		X					
Women with children should not work outside the home		X					
Women are too emotional to solve problems well		X					
Women should care for children and the home		X					
Women are physically and emotionally weaker than men		X					
Perceived disapproval of...							
Parents	X	X	X	X	X	X	X
Peers	X	X	X	X	X	X	X
People from work					X	X	X
Partner						X	X
Attitude favouring delinquency							
Destroying property	X	X	X	X	X	X	X
Hitting someone	X	X	X	X	X	X	X
Breaking into a vehicle	X	X	X	X	X	X	X
Selling hard drugs	X	X	X	X	X	X	X
Stealing something > $50.	X	X	X	X	X	X	X
Pregnancy	X	X	X	X	X	X	X
Presence of children	X	X	X	X	X	X	X
Religion			X	X	X	X	X

Appendix F: Cronbach's Alpha for Scale Variables, both Time-Invariant and Time-Variant

	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**	**Wave 5**	**Wave 6**	**Wave 7**
	1976	**1977**	**1978**	**1979**	**1980**	**1983**	**1986**
Time Invariant							
Early Conduct Disorder (10 items)							0.621
Parental Deviance (10 items)	0.803						
Beliefs in Conventional Values (2 items)	0.240						
School commitment (5 items)	0.640						
Self-Control (14 items)	0.868						
Subjective Parental Attachment/Parental Rejection (5 items)	0.717						
Sex Roles (5 items)		0.62					
Time Variant							
Self-reported Criminal Behaviour (15 items)	0.810	0.760	0.784	0.793	0.792	0.740	0.674
Opportunity (3 items)	0.802	0.842	0.875	0.884	0.905	0.918	0.929
Objective Family Attachment/Parental Supervision (3 items)	0.687	0.722	0.732	0.728	0.760	0.792	0.819
Involvement in School (3 items)	0.530	0.608	0.756	0.836	0.881	0.943	0.950
Perceived disapproval of parents (5 items)	0.789	0.827	0.823	0.855	0.861	0.863	0.877
Perceived disapproval of peers (5 items)	0.862	0.897	0.867	0.884	0.886	0.825	0.891
Attitude favouring criminal behaviour (5 items)	0.753	0.759	0.806	0.835	0.842	0.837	0.859
Dependent Variable – Serious Criminal Behaviour (8 items)	0.707	0.614	0.670	0.695	0.639	0.564	0.492
Dependent Variable – Non -Serious Criminal Behaviour (7 items)	0.639	0.612	0.628	0.610	0.619	0.600	0.510

Note. Cronbach Alpha's will become lower as variables become non-normal as is often the case with count variables

Table G1. Non-response patterns across waves

Wave 1		Wave 2		Wave 3		Wave 4		Wave 5		Wave 6		Wave 7	
Responder	1725	Responder	1655	Responder	1605	Responder	1513	Responder	1438	Responder	1352	Responder	1233
												Non-Responder	119
										Non-Responder	86	Responder	39
												Non-Responder	47
								Non-Responder	75	Responder	39	Responder	35
												Non-Responder	4
										Non-Responder	36	Responder	11
												Non-Responder	25
						Non-Responder	92	Responder	33	Responder	31	Responder	21
												Non-Responder	10
										Non-Responder	2	Responder	1
												Non-Responder	1
								Non-Responder	59	Responder	14	Responder	10
												Non-Responder	4
										Non-Responder	45	Responder	1
												Non-Responder	44
				Non-Responder	50	Responder	7	Responder	6	Responder	5	Responder	4
												Non-Responder	1
										Non-Responder	1	Responder	0
												Non-Responder	1
								Non-Responder	1	Responder	1	Responder	1
												Non-Responder	0
										Non-Responder	0	Responder	0
												Non-Responder	0
						Non-Responder	43	Responder	1	Responder	1	Responder	1
												Non-Responder	0
										Non-Responder	0	Responder	0
												Non-Responder	0
								Non-Responder	42	Responder	19	Responder	9
												Non-Responder	10
										Non-Responder	23	Responder	0
												Non-Responder	23
		Non-Responder	70	Responder	21	Responder	16	Responder	14	Responder	13	Responder	10
												Non-Responder	3
										Non-Responder	1	Responder	1
												Non-Responder	0
								Non-Responder	2	Responder	2	Responder	1
												Non-Responder	1
										Non-Responder	3	Responder	3

Wave 1	Wave 2	Wave 3		Wave 4		Wave 5		Wave 6		Wave 7	
										Non-Responder	0
				Non-Responder	5	Responder	0	Responder	0	Responder	0
										Non-Responder	0
								Non-Responder	0	Responder	0
										Non-Responder	0
						Non-Responder	5	Responder	2	Responder	2
										Non-Responder	0
								Non-Responder	3	Responder	3
										Non-Responder	0
		Non-Responder	49	Responder	7	Responder	2	Responder	2	Responder	1
										Non-Responder	1
								Non-Responder	0	Responder	0
										Non-Responder	0
						Non-Responder	5	Responder	4	Responder	2
										Non-Responder	2
								Non-Responder	1	Responder	0
										Non-Responder	1
				Non-Responder	42	Responder	0	Responder	0	Responder	0
										Non-Responder	0
								Non-Responder	0	Responder	0
										Non-Responder	0
						Non-Responder	42	Responder	13	Responder	3
										Non-Responder	10
								Non-Responder	29	Responder	0
										Non-Responder	29

Table G2. Gender distribution across all waves (including non-response)

		Men % (*n*)	Women % (*n*)	Total % (*n*)
Wave 1		100% (918)	100% (807)	100% (1725)
	Missing	0% (0)	0% (0)	0% (0)
Wave 2		95.8% (879)	96.2% (776)	95.9% (1655)
	Missing	4.2% (39)	3.8% (31)	4.1% (70)
Wave 3		94.0% (863)	94.5% (763)	94.3% (1626)
	Missing	6.0% (55)	5.5% (44)	5.7% (99)
Wave 4		87.7% (805)	91.4% (738)	89.4% (1543)
	Missing	12.3% (113)	8.6% (69)	10.6% (182)
Wave 5		85.3% (783)	88.1% (711)	86.6% (1494)
	Missing	14.7% (135)	11.9% (96)	13.4% (231)
Wave 6		84.0% (771)	90.0% (726)	86.6% (1497)
	Missing	16.0% (147)	10.0% (81)	13.2% (228)
Wave 7		76.5% (702)	84.6% (863)	80.3% (1385)
	Missing	23.5% (216)	15.4% (124)	19.7% (340)

Table G3. Age distribution across all waves for all males and females

		Age at Wave 1						
		11	**12**	**13**	**14**	**15**	**16**	**17**
Age	**11**	14.6 % (252)						
	12	14.6% (242)	14.9% (259)					
	13	14.8% (241)	15.2% (252)	15.6% (269)				
	14	14.9% (230)	15.3% (249)	15.6% (259)	15.0% (258)			
	15	15.4% (230)	15.4% (237)	15.5% (252)	14.7% (243)	14.7% (253)		
	16	15.3% (229)	15.5% (231)	16.1% (249)	14.6% (238)	14.7% (231)	13.9% (239)	
	17	15.3% (229)	15.4% (230)	16.4% (245)	14.4% (222)	14.5% (235)	14.7% (231)	11.3% (197)
	18	15.3% (229)	15.4% (230)	16.0% (239)	14.2% (212)	14.2% 219	13.8 (225)	11.2% (185)
	19	15.2% (211)	15.4% (230)	16.0% (239)	14.6% (218)	13.9% (207)	13.6% (210)	11.4% (186)
	20	15.2% (211)	15.7% (218)	16.0% (239)	14.6% (218)	14.0% (210)	13.7% (204)	11.4% (176)
	21	15.2% (211)	15.7% (218)	15.6% (216)	14.6% (218)	14.0% (210)	13.9% (208)	11.0% (165)
	22		15.7% (218)	15.6% (216)	14.1% (195)	14.0% (210)	13.9% (208)	10.9% (163)
	23			15.6% (216)	14.1% (195)	14.1% (195)	13.9% (208)	10.9% (163)
	24				14.1% (195)	14.1% (195)	13.7% (190)	10.9% (163)
	25					14.1% (195)	13.7% (190)	11.6% (160)
	26						13.7% (190)	11.6% (160)
	27							11.6% (160)

Table G4. Age distribution across all waves for all males

		Age at Wave 1						
		11	**12**	**13**	**14**	**15**	**16**	**17**
Age	**11**	13.8% (127)						
	12	14.1% (124)	13.9% (128)					
	13	14.4% (124)	14.1% (124)	14.7% (135)				
	14	14.8% (119)	14.3% (123)	14.7% (129)	16.1% (148)			
	15	15.2% (119)	14.3% (115)	14.7% (127)	15.9% (140)	15.0% (138)		
	16	15.2% (117)	14.3% (112)	15.3% (123)	15.8% (136)	14.9% (131)	14.3% (131)	
	17	15.2% (117)	14.8% (114)	15.6% (122)	15.3% (123)	14.7% (127)	14.3% (126)	12.1% (111)
	18	15.2% (117)	14.8% (114)	14.8% (114)	14.9% (117)	14.3% (115)	14.5% (125)	11.9% (105)
	19	15.5% (109)	14.8% (114)	14.8% (114)	15.2% (117)	13.9% (109)	14.2% (114)	11.7% (101)
	20	15.5% (109)	14.7% (103)	14.8% (114)	15.2% (117)	14.0% (108)	14.7% (115)	11.9% (96)
	21	15.5% (109)	14.7% (103)	14.2% (100)	15.2% (117)	14.0% (108)	14.8% (114)	11.4% (89)
	22		14.7% (103)	14.2% (100)	14.4% (101)	14.0% (108)	14.8% (114)	11.3% (87)
	23			14.2% (100)	14.4% (101)	14.1% (99)	14.8% (114)	11.3% (87)
	24				14.4% (101)	14.1% (99)	14.8% (104)	11.3% (87)
	25					14.1% (99)	14.8% (104)	12.3% (86)
	26						14.8% (104)	12.3% (86)
	27							12.3% (86)

Table G5. Age distribution across all waves for all females

		Age at Wave 1						
		11	**12**	**13**	**14**	**15**	**16**	**17**
Age	**11**	15.5% (125)						
	12	15.2% (118)	16.0% (129)					
	13	15.3% (117)	16.5% (128)	16.6% (134)				
	14	15.0% (111)	16.5% (126)	16.8% (130)	13.6% (110)			
	15	15.6% (111)	16.5% (122)	16.4% (125)	13.3% (103)	14.3% (115)		
	16	15.4% (112)	16.7% (119)	17.1% (126)	13.4% (102)	14.4% (112)	13.4% (108)	
	17	15.4% (112)	16.0% (116)	17.3% (123)	13.4% (99)	14.2% (108)	13.5% (105)	10.7% (86)
	18	15.4% (112)	16.0% (116)	17.2% (125)	13.4% (95)	14.1% (104)	13.1% (100)	10.3% (80)
	19	14.9% (102)	16.0% (116)	17.2% (125)	13.9% (101)	13.8% (98)	13.0% (96)	11.1% (85)
	20	14.9% (102)	16.8% (115)	17.2% (125)	13.9% (101)	14.0% (102)	12.5% (89)	10.8% (80)
	21	14.9% (102)	16.8% (115)	17.0% (116)	13.9% (101)	14.0% (102)	12.9% (94)	10.7% (76)
	22		16.8% (115)	17.0% (116)	13.8% (94)	14.0% (102)	12.9% (94)	10.5% (76)
	23			17.0% (116)	13.8% (94)	14.1% (96)	12.9% (94)	10.5% (76)
	24				13.8% (94)	14.1% (96)	12.6% (86)	10.5% (76)
	25					14.1% (96)	12.6% (86)	10.8% (74)
	26						12.6% (86)	10.8% (74)
	27							10.8% (74)

Table G6. Ethnic distribution across waves (including non-response)

		Males			Females			All		
		Caucasian	**Visible Minority**	**Total**	**Caucasian**	**Visible Minority**	**Total**	**Caucasian**	**Visible Minority**	**Total**
		% (*n*)	**% (*n*)**	**% (*n*)**	**% (*n*)**	**% (*n*)**	**% (*n*)**	**% (*n*)**	**% (*n*)**	**% (*n*)**
Wave 1		100	100	100	100	100	100	100	100	100
		(714)	(204)	(918)	(647)	(160)	(807)	(1361)	(364)	(1725)
	Missing	0	0	0	0	0	0	0	0	0
		(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Wave 2		96.5	93.1	95.8	96.6	94.4	96.2	96.5	93.7	95.9
		(689)	(190)	(879)	(625)	(151)	(776)	(1314)	(341)	(1655)
	Missing	3.5	6.9	4.2	3.4	5.6	3.8	3.5	6.3	4.1
		(25)	(14)	(39)	(22)	(9)	(31)	(47)	(23)	(70)
Wave 3		95.4	89.2	94.0	95.2	91.9	94.5	95.3	90.4	94.3
		(681)	(182)	(863)	(616)	(147)	(763)	(1297)	(329)	(1626)
	Missing	4.6	10.8	6.0	4.8	8.1	5.5	4.7	9.6	5.7
		(33)	(22)	(55)	(31)	(13)	(44)	(64)	(35)	(99)
Wave 4		87.8	87.3	87.7	92.0	89.4	91.4	89.8	88.2	89.4
		(627)	(178)	(805)	(595)	(143)	(738)	(1222)	(321)	(1543)
	Missing	12.2	12.7	12.3	8.0	10.6	8.6	10.2	11.8	10.6
		(87)	(26)	(113)	(52)	(17)	(69)	(139)	(43)	(182)
Wave 5		84.9	86.8	85.3	89.0	84.4	88.1	86.8	85.7	86.6
		(606)	(177)	(783)	(576)	(135)	(711)	(1182)	(312)	(1494)
	Missing	15.1	13.2	14.7	11.0	15.6	11.9	13.2	14.3	13.4
		(108)	(27)	(135)	(71)	(25)	(96)	(179)	(52)	(231)
Wave 6		83.5	85.8	84.0	90.0	90.0	90.0	86.6	87.6	86.8
		(596)	(175)	(771)	(582)	(144)	(726)	(1178)	(319)	(1497)
	Missing	16.5	14.2	16.0	10	10	10	13.4	12.4	13.2
		(118)	(29)	(147)	(65)	(16)	(81)	(183)	(45)	(228)
Wave 7		78.4	69.6	76.5	87.5	73.1	84.6	82.7	71.2	80.3
		(560)	(142)	(702)	(566)	(117)	(683)	(1126)	(259)	(1385)
	Missing	21.6	30.4	23.5	12.5	26.9	15.4	17.3	28.8	19.7
		(154)	(62)	(216)	(81)	(43)	(124)	(235)	(105)	(340)

Table G7. Means and confidence intervals for self-reported serious criminal behaviour by age and gender

		Age at Wave 1							
	Wave	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Men	**1**	0.37 (0.24-0.50)	0.37 (0.25-0.49)	0.64[a] (0.42-0.85)	0.55[b] (0.38-0.72)	0.92[c, d] (0.66-1.18)	0.61 (0.39-0.83)	0.69 (0.48-0.91)	
	2		0.31 (0.18-0.44)	0.29 (0.17-0.42)	0.47 (0.29-0.65)	0.61 (0.42-0.80)	.78 (0.57-0.99)	.48 (0.31-0.66)	.48 (0.31-0.64)
	3			0.20[a] (0.11-0.29)	0.24[b] (0.13-0.35)	0.59 (0.38-0.81)	0.56 (0.38-0.73)	0.73 (0.49-0.98)	.58 (0.37-0.78)
	4				0.37 (0.20-0.54)	0.36[c] (0.19-0.52)	0.54 (0.31-0.77)	0.61 (0.40-0.82)	0.54 (0.35-0.73)
	5					0.35[d] (0.18-0.53)	0.33 (0.17-0.49)	0.43 (0.22-0.63)	0.45 (0.28-0.62)
	6 (1983)								0.38 (0.23-0.52)
Women	**1**	0.29 (0.09-0.49)	0.26 (0.15-0.38)	0.31 (0.15-0.46)	0.20 (0.09-0.31)	0.24 (0.07-0.42)	0.18 (0.07-0.28)	0.22 (0.09-0.35)	
	2		0.08 (0.03-0.14)	0.18 (0.09-0.27)	0.15 (0.07-0.23)	0.12 (0.04-0.20)	0.21 (0.07-0.34)	0.09 (0.02-0.15)	0.05 (0.01-0.10)
	3			0.08 (0.01-0.14)	0.21 (0.10-0.32)	0.10 (0.04-0.17)	0.11 (0.04-0.18)	0.10 (0.04-0.17)	0.03 (0-0.07)
	4				0.19 (0.05-0.33)	0.24 (0.11-0.36)	0.13 (0.06-0.21)	0.11 (0.01-0.22)	0.08 (0.01-0.14)
	5					0.20 (0.05-0.35)	0.18 (0.08-0.29)	0.09 (0.03-0.15)	0.12 (0.03-0.20)
	6 (1983)								0.13 (0.01-0.25)

Note. Means and 95% confidence intervals presented in tables. Means with different superscripts are significantly different at least at $p < 0.05$.

Table G8. Means and confidence intervals for self-reported non-serious criminal behaviour by age and gender

		Age at Wave 1							
	Wave	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Men	**1**	0.19 (0.11-0.26)	0.37 (0.25-0.49)	0.59[a] (0.40-0.78)	0.55 (0.41-0.70)	0.95[b, c] (0.71-1.19)	0.66 (0.46-0.86)	0.62 (0.44-0.80)	
	2		0.26 (0.16-0.37)	0.33 (0.22-0.45)	0.67 (0.45-0.89)	0.64 (0.45-0.83)	0.94[d] (0.72-1.16)	0.69 (0.49-0.89)	0.69 (0.49-0.89)
	3			0.28[a] (0.18-0.38)	0.38 (0.23-0.53)	0.62 (0.42-0.83)	0.72 (0.53-0.91)	0.85 (0.62-1.08)	0.79 (0.57-1.02)
	4				0.40 (0.23-0.56)	0.33[b] (0.19-0.47)	0.67 (0.45-0.89)	0.70 (0.49-0.91)	0.64 (0.45-0.83)
	5					0.44[C] (0.27-0.60)	0.41[d] (0.25-0.57)	0.66 (0.45-0.86)	0.63 (0.44-0.82)
	6 (1983)								0.54 (0.36-0.71)
Women	**1**	0.26 (0.09-0.44)	0.25 (0.14-0.35)	0.26 (0.13-0.40)	0.37 (0.24-0.51)	0.35 (0.18-0.51)	0.36 (0.20-0.53)	0.47 (0.28-0.65)	
	2		0.13 (0.04-0.21)	0.21 (0.12-0.29)	0.24 (0.13-0.35)	0.32 (0.19-0.46)	0.30 (0.17-0.43)	0.29 (0.14-0.44)	0.20 (0.08-0.32)
	3			0.21 (0.10-0.31)	0.32 (0.18-0.45)	0.19 (0.09-0.30)	0.41 (0.23-0.59)	0.24 (0.12-0.37)	0.17 (0.07-0.27)
	4				0.22 (0.08-0.35)	0.32 (0.18-0.46)	0.21 (0.09-0.32)	0.28 (0.12-0.43)	0.13 (0.05-0.22)
	5					0.29 (0.12-0.46)	0.26 (0.11-0.41)	0.21 (0.10-0.33)	0.20 (0.09-0.31)
	6 (1983)								0.31 (0.16-0.47)

Note. Means and 95% confidence intervals presented in tables. Means with different superscripts are significantly different at least at $p < 0.05$.

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Publications:

Academic Publications

Jennie Thompson & Suzanne Ricard. 2009. "Women's Role in Serial Killing Teams: Reconstructing a Radical Feminist Perspective" *Critical Criminology* 14(4): 261-275.

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